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NOTICES—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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EASTER HOLIDAYS.

In consequence of the Easter Holidays the offices of "The Chemical Age" will be closed from Thursday evening, April 13, to Tuesday morning, April 18.

The Prosecution of Research

It really seems at last as if we were awaking to a sense of the part which research must more and more play in the maintenance of this country's commercial position. Apart from what is being done by central and directing bodies in London—both under Government and under commercial or public management—three separate incidents of a distinctly encouraging character are to be noted. The fact that they all arise in Manchester, itself a great commercial centre and, still more, the natural capital of the largest industrial community in England, or indeed in the world, is significant of the increasingly close connexion between science and industry.

The first event is the opening at Didsbury of the Shirley Institute, the headquarters of the British Cotton Industry Research Association. The house

itself, the Towers, built by a former proprietor of the *Manchester Guardian*, passed in 1874 into the possession of Daniel Adamson, and there, in the room now used as the library and council chamber of the Research Association, it was decided to embark on the construction of the Manchester Ship Canal. Such a precedent is in itself a stimulation. Under its roof the chemist, physicist, technologist, and probably also the engineer will work under the central and co-ordinating guidance of one director, Dr. A. W. Crossley. The chemical equipment includes a special department for the study of colloidal problems. Among the most interesting points in this promising scheme is the preparation of a bibliography of the literature of cotton. Already more than 2,000 works on the subject have been indexed, and there is to be issued periodically a "Summary of Current Literature," similar in purpose to our own weekly "References." The scheme altogether is one of great interest and promise, and the part that chemistry plays in the cotton industry is fully recognised.

The second incident to be noted is the paper, already referred to in our last issue, on "the relation between chemical constitution and antiseptic action in the coal tar dyestuff," read before the Manchester Section of the Society of Chemical Industry, by Mr. T. H. Fairbrother and Dr. Arnold Renshaw. Here we had disclosed the beginnings of discoveries which may give to dyestuff research a scientific and sociological importance far exceeding any commercial aspects of the dyestuff industry itself. The occasion brings out the essential element in all true research work, namely, the endless possibility of discoveries quite outside the immediate problems under investigation. It is, in fact, in these potential possibilities, rather than in the verification or capture of things already suspected, that the real romance of research lies. In the unlovely valley of Blackley, at the works of the British Dyestuffs Corporation, these patient investigations have for some time been proceeding. It would be unsafe at present to set any limit as to what they may ultimately lead to. It is enough to say that already results of great importance have been obtained and to hope that the inquiry will be steadily prosecuted.

Closely allied with this is the research work in dyeing encouraged and actually carried out by the Society of Dyers and Colourists, whose annual meeting was held in Manchester last week. As the president pointed out, no industry affords better facilities than the dye manufacturing industry for the development and training of chemists, and not the least of the indirect advantages of maintaining such a national industry is the possession it assures the country of a national school of chemistry with all the general as well as specific advantages that go with it. Here, again, the activities of the society are taking a literary form. So good is the progress already made with the society's new colour index, representing distinct advances on the well-known German work by Schultz,

that it is hoped to issue the first part in June and to complete the work in twelve monthly issues. The society may be warmly congratulated on a service of such wide and permanent value. The fact that a group of such events as we have noted are now accepted almost as a matter of course is the best proof that the cause of research is really moving forward.

Pulverized Coal Development

So far as the utilization of pulverized coal is concerned it may be said that the experience born of practical acquaintance with the system during the past few years has now made it possible to contemplate firing by this means with almost an entire absence of the uneasy feeling that accident or disaster may be lying in store for one. It is, of course, common knowledge that a number of fires and explosions have taken place in plants of the kind, but it is the lessons of such occurrences that have prompted minute inquiry into their origin, and, as in every process of evolution, it is from the mistakes made in the first place that a trustworthy method of operation has sprung. As a great deal of the pioneer work with pulverized coal has been carried out in America it is most important that there should be a full appreciation over here of the methods which have been devised to preclude accidents. Some of the American literature on the subject is particularly valuable, but, as it is only sparsely circulated in this country, there are many who are unable to take advantage of the opportunities which it provides. At the moment there is no text-book in this country where guidance may be sought, although, of course, Mr. L. C. Harvey's Reports have done much to fill the gap. We are, however, able to announce that Benn Brothers, Ltd., the publishers of *THE CHEMICAL AGE*, have made arrangements to meet the need; they have arranged with Dr. J. T. Dunn, the well-known fuel consultant of Newcastle-on-Tyne, to contribute to their "Gas and Fuel" series of text books—particulars of which were recently given in these columns—a volume on "Pulverized and Colloidal Fuels."

While speaking of the literature of this subject we might refer to the paper which Mr. L. D. Tracey presented at a recent meeting of the Engineers' Society of Western Pennsylvania. Mr. Tracey dealt in a remarkably comprehensive manner with the explosion hazards in industrial plants due to the use of pulverized coal, and his paper provides what is so far the most valuable collection of advice on the subject which we recollect seeing. It is not possible to bring out here all his arguments, but one or two points to which he refers demand passing notice. For instance, in connexion with the drying of coal, it has been found that when high temperatures have been employed for the purpose moisture was still found in the bins. Paradoxical as it may seem, coal dried at abnormally high temperatures will cause more moisture than when dried at temperatures of from 100° to 150°F. The reason for this is that very hot coal carries with it, as it travels from the dryer, a certain amount of vapour due to the evaporation of moisture in the surrounding air with which the hot coal is brought in contact. This accompanies the coal to the bins, and is condensed by the colder sides of the bins and conveyors. It is suggested, therefore, that better results might be obtained if the coal were dried at temperatures

approaching those mentioned above, which would lead to a drier surrounding atmosphere and obviate most of the condensation. Mr. Tracey's paper is brimful of really practical advice on many such points, and we have no hesitation in bringing it to the attention of the growing number of industrial engineers and chemists who are interested in the problem over here.

British Scientists' Tribute to Pasteur

To commemorate the centenary of the birth of Pasteur, the university and civic authorities of Strasbourg, with the consent of the Pasteur Institute and the approval of the family, have decided to erect a statue opposite the University of Strasbourg, where, as a professor, Pasteur began his distinguished career. The inaugural ceremonies are fixed for May 1 of next year, under the patronage of the President of the French Republic, and they will include the unveiling of the statue and the opening of an exhibition of hygiene and bacteriology. This exhibition will be designed to illustrate the advances made in various branches of science as the result of Pasteur's discoveries, and at the same time a Congress of Hygiene and Bacteriology will be held for the discussion of questions relating to the prevention of disease.

The sympathy of this country with the projects of the French committee takes the practical form of a representative British committee. This consists of Sir Charles Sherrington, President of the Royal Society (chairman); Mr. A. Chaston Chapman, President of the Institute of Chemistry (treasurer); Mr. H. E. Field, President of the Institute of Brewing; Professor Percy F. Frankland, Emeritus Professor of Chemistry in the University of Birmingham; Sir John M'Fadyean, Principal of the Royal Veterinary College; Professor C. J. Martin, Director of the Lister Institute; Sir W. J. Pope, Professor of Chemistry in the University of Cambridge; Sir James Walker, President of the Chemical Society; and Sir Almroth Wright, Principal of the Institute of Pathology and Research, St. Mary's Hospital. Those who desire to co-operate in the memorial—and this country should possess many such—are invited to send their contributions to the Memorial Fund to the general secretary and treasurer, M. Th. Héring, 6, rue des Veaux, Strasbourg, or to the British treasurer, Mr. A. Chaston Chapman, the Institute of Chemistry, 30, Russell Square, London. The Commissioner-General, Professor Borrel, is anxious to be furnished with the names of manufacturers and business men in this country to whom the exhibition might be of interest, and any who can assist in this matter are requested to communicate with him at 3, Rue Koeberlé, Strasbourg.

Certified Oxygen Cylinders

MANY of our readers have no doubt received a copy of the letter which Major Cooper Key (Chief Inspector of Explosives) has quite recently circulated among the users of oxygen contained in cylinders. The purport of the letter is to warn the many users of oxygen and hydrogen gas that there are at the present time in circulation in this country a number of cylinders which fail to comply either with the recommendations contained in the recent report issued by the Gas Cylinders Research Committee of the Department of Scientific and Industrial Research, or with the

previous recommendations made by a similar committee in 1895. Thus, quite unknowingly, some users of compressed gas are shouldering a responsibility which would be theirs in case of accident through faulty construction. Major Cooper Key has very rightly taken the matter into his own hands, and in his circular letter he recommends that all who utilise compressed gas should protect themselves, their employees, and the public by requiring all firms who supply compressed gas to provide a certificate to the effect that every cylinder sent out by them is manufactured, tested, and filled strictly in accordance with the recommendations issued by the above-mentioned committees.

It certainly will be a matter for surprise for many of the regular users of compressed gas to find that such a warning is necessary; but it would seem that since the armistice a number of obsolete war cylinders have been disposed of for next to nothing, many of them falling decidedly short of the new official regulations. It is a difficult matter for the consumer to judge accurately as to whether or not he is running any risk; but, as one well-known firm of gas compressors points out, weight (although it is not the only condition with which cylinders must comply) will usually give a very good indication as to whether the regulations are complied with. All consumers would, however, do well to write to their suppliers and find out what they have got to say in the matter. At the same time there is no necessity for a feeling of insecurity so long as the recognised and long-established firms are dealt with. Such firms have unanimously welcomed the opportunity which Major Cooper Key's letter has provided.

To avoid any misunderstanding we might mention that cylinders containing compressed or dissolved acetylene are not included in the indictment. These cylinders are governed separately by an order made by the Home Office in June, 1919.

German Chemicals at Leipzig

FROM a London firm of merchants who have just returned from the Leipzig Fair we learn that, taken as a whole, the Fair was disappointing from a chemical point of view. Very few actual chemical manufacturers were showing, and well-known firms in all branches of dyes, fines, and heavies were conspicuous by their absence. A large show was made of patent medicines, dressings, vermin killers, &c., including veterinary preparations, together with soaps, cosmetic preparations, &c., which are naturally of no interest here. Byk Guldenwerke Chem Fabrik Berlin had an interesting show of nitrate of potash and gold and silver salts. Consolidated Alkali Werke A. G. Westergeln were showing bromide salts, Epsom salts, and bleaching powder, but were not sellers for prompt delivery. Dr. Koenig & Co. G.m.b.H., Leipzig, were showing caustic potash, carbonate of potash, and carbonate of ammonia. Dr. Kruger and Sommerfeld G.m.b.H., Cassel, had a stand of the same products. "In general," our informants add, "no firm prices could be quoted or prompt delivery to rails be guaranteed. Apparently there is a great shortage of raw materials and coal, so that the German firms are unable to supply even half the needs of their own country."

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Points from Our News Pages

The Referee under the Safeguarding of Industries Act began on April 1 an inquiry into a complaint that pinene and synthetic camphor had been improperly included in the Board of Trade list (p. 450).

The Referee under Part I. of the Safeguarding of Industries Act has decided in favour of the Board of Trade on the complaint of A. Boake Roberts, & Co. that liquid sulphur dioxide had been improperly excluded from the Board of trade list (p. 451).

Important results of dye-stuff research in relation to medical science were announced at a meeting of the Manchester Section of the Society of Chemical Industry on March 30 (p. 452).

In connexion with the annual meeting of the Society of Dyers and Colourists in Manchester on March 31, Professor E. Bronnert, of Strasburg, read an important paper on recent progress in the artificial silk industry (p. 455).

In a petition of right claiming damages against the Crown for breach of contract the Clayton Aniline Co. have been awarded judgment for £22,368 with costs (p. 457).

The results of recent investigations on the action of ammonia on reducing sugars, and particulars of a micro-Kjeldahl method of estimating hydrogen, were given at a meeting of the Birmingham Section of the Society of Chemical Industry (p. 458).

In his final "Cantor" lecture on Essential Oils Mr. L. G. Radcliffe referred to developments in the manufacture of flavouring esters in this country (p. 459).

It is stated in our London Chemical Market report that the spot market in chemicals has been quite active, and a shortage of supplies for early delivery is becoming apparent. Markets are described as in a much healthier state (p. 467).

Our Scottish Chemical Market report states that there has been little or no improvement in the amount of business during the past week. (p. 469).

Books Received

ZIRCONIUM. By F. P. Venable. New York: The Chemical Catalog Co., Inc. Pp. 173. \$2.50 net.

TECHNICAL RECORDS OF EXPLOSIVE SUPPLY: NO. VIII., SOLVENT RECOVERY. London: H.M. Stationery Office. Pp. 22. 3s. 3d. net.

INORGANIC CHEMISTRY. By T. M. Lowry. London: Macmillan & Co., Ltd. Pp. 940. 28s. net.

THE GAS CHEMIST'S HANDBOOK (Revised Edition). Compiled and published by the American Gas Association, New York. Pp. 608. \$6.50 net.

The Calendar

April 11	Institute of Metals, Birmingham Section. Annual Meeting. 7.30 p.m.	Chamber of Commerce, Birmingham.
11	Institution of Petroleum Technologists. "Galicia and its Petroleum Industry." A. Millar. Professor J. S. S. Brame. 5.30 p.m.	The Royal Society of Arts, John Street, Adelphi, London.
12	Society of Glass Technology. Annual General Meeting. 2.30 p.m.	Sheffield.
13	Optical Society. Ordinary Meeting. 7.30 p.m.	Imperial College of Science and Technology, London, 2, Whitehall Court, London.
17	Chemical Industry Club. Ordinary Meeting. Lecture by Dr. M. O. Forster.	Wilberforce Café, Hull.
18	Hull Chemical and Engineering Society. Annual Meeting.	20, Hanover Square, London.
19	Royal Microscopical Society: "The Use of the Microscope in Cotton Research." Dr. S. C. Harland and H. J. Denham. "The Use of the Microscope in Connexion with the Diseases of Rubber." H. Sutcliffe.	

The Safeguarding of Industries Act

Pinene and Synthetic Camphor Inquiry

MR. CYRIL ATKINSON, K.C., the Referee, who is considering complaints under Part I. of the Safeguarding of Industries Act that certain substances have been improperly included in, or excluded from, the Board of Trade list of dutiable articles, began the hearing of a case concerning synthetic camphor on Saturday, April 1.

SIR ARTHUR COLEFAX, K.C., said he appeared, with Mr. K. R. Swan, for the British Xylonite Co., Ltd., who were the complainants supporting the application, which affected two substances, namely, pinene, and a substance which he would call turpentine camphor, which was more commonly called artificial camphor, and sometimes improperly called synthetic camphor. The British Xylonite Co., he believed, were the only users in this country of turpentine camphor.

The Board of Trade had intimated to the complainants that they no longer questioned that pinene had been improperly included in their list, and he asked, therefore, that the referee should make an award excluding pinene from the list.

With regard to turpentine camphor, it would be a surprise to many that the Board of Trade had put this substance into the list. There was not an ounce made here, there never had been, and it was highly improbable that the substance ever would be made here. It was inconceivable, under these circumstances, that it should ever have been put into the list, and he was going to ask the Referee to rule that Part I of the Act could not apply where there was no industry in this country. The Board of Trade had never thought it right to be advised as to the meaning of the Act, and it had been admitted on a previous occasion that the question of whether or not the manufacture of a substance was a key industry had never been considered; they had put this particular substance into the list without considering whether there was an industry in this country at all. The British Xylonite Co. were the only purchasers of the substance here, and they manufactured celluloid, and competed in the markets of the world in the selling of their products. The imposition of the duty meant a very serious handicap to the firm in competing with other countries; evidence would be given that it might mean many thousands of pounds to the firm, and there was no prospect of obtaining one ounce of the substance of British origin.

MR. WHITEHEAD, for the Board of Trade, said the view of the Board of Trade was that synthetic camphor was not the same thing as artificial camphor; that, in fact, turpentine camphor and artificial camphor were two names applied to pinene hydrochloride.

Evidence for British Xylonite Co.

MR. CHARLES PEARCE MERRIAM (joint managing director of the British Xylonite Co., Ltd.), giving evidence, said that, so far as he knew, the company were the only makers of celluloid in this country. They employed about 1,800 workpeople, but before the war the number employed was about 2,400 in this country. In 1906 the amount of artificial or turpentine camphor used by the company was 26 per cent. of all the camphor used; in 1907, 34 per cent.; in 1908, 30 per cent.; and in 1909, 9 per cent. Natural camphor was very nearly a Japanese monopoly, and it lay within the power of the Government there to determine its price, unless, of course, they had to face the competition of turpentine camphor. The determining factor with regard to whether the company used artificial or natural camphor was price, mainly. There was now no turpentine camphor manufactured in this country, but years ago it was possible to buy turpentine camphor manufactured here. There were three camphor companies in this country a number of years ago, which all failed, but one of them made a usable article. It was the policy of the Xylonite Co. to encourage the manufacture of turpentine camphor in this country, but manufacture here had never amounted to very much. Two of the concerns he had mentioned had failed, because they could not make quite the right thing. The competition of natural camphor was a deterrent to anyone contemplating starting the industry here. As soon as the Japanese Government gained the monopoly, they not only raised the price, but stopped supplies of natural camphor, or rationed buyers, which made things extremely unpleasant. Therefore, the Xylonite Co. encouraged the German turpentine camphor, and when the Japanese Government found out what was going on they reduced their price and from 1907 until the

outbreak of war they kept their prices below those of turpentine camphor, and did not ration. When the war came the Japanese prices were raised to six times the pre-war prices.

Immediately after the war the company set to work to study the question of synthetic camphor, and had spent over £10,000 in attempting to make it. They had been successful to the extent that they could make it, but the witness was not prepared to advise putting down plant for its manufacture. So far as they could tell, in order to supply the market for turpentine camphor they would have to spend £100,000, and they could see no money in making it. The imposition of a duty on turpentine camphor would obviously have the effect of further increasing the price of natural camphor, and the only people to benefit would be the Japanese and our foreign competitors. The company bought very little turpentine camphor from Switzerland, and his information was that the Swiss factory had closed down. Messrs. Shering, of Berlin, were the important people. There was also in America the Dupont de Nemours concern, which had bought up the Celluloid Co. That concern had established the manufacture of turpentine camphor in their own country, laid down plant and engaged skilled assistance, but he had been told that within a year or two they had closed down their factory.

In reply to the Referee, the witness said he spoke of synthetic camphor in contra-distinction to natural camphor.

Cross-examined by Mr. Whitehead, the witness said that artificial camphor was no good for his job. He had had to import the raw material in order to make turpentine camphor. He thought the raw material could be obtained in Germany. The price of artificial camphor in September, 1921, was 28s. per cwt., and in November, 1921, the price of natural camphor was 39s. per cwt. The price of natural camphor had been higher than that of turpentine camphor in recent years, but before the war the price of natural camphor was the lower. The price of natural camphor was still two-and-a-half times what it was before the war. He did not agree with Mr. Whitehead's suggestion that the difficulty of making turpentine camphor had led to the manufacture being abandoned in different countries. The company started experimental work in connexion with making turpentine camphor two years ago, and were able to make it on a laboratory scale some little time ago, but that was a different matter from making it on a commercial scale. It did not take very long to find out how to make the right stuff.

Re-examined by Sir Arthur Colefax, the witness said that in the year before the war the company used camphor to the value of £101,000. Taking the price of turpentine camphor at the time of the last purchase, September, 1921, a duty of 33½ per cent. would mean £33,728.

Relying to the Referee, the witness said that at the present time conditions were abnormal, and the value of the mark had an important bearing. He imagined that if the duty were imposed, the value of the mark would enable the company to buy turpentine camphor still at a lower price than natural camphor. At present turpentine camphor was not available, but he believed it would be soon. The possibility of importing the turpentine camphor was a check on the increase of the price of natural camphor.

Chief Chemist's Views

MR. F. SPROXTON, chief chemist to the British Xylonite Co. for the past fourteen years, said he was largely engaged in research work and had given special attention to the constitution, properties, and methods of manufacture of turpentine or artificial camphor and also to the manufacture of celluloid. He disagreed with the contention of the Board of Trade that in the manufacture of celluloid from camphor and nitrocellulose there is a reaction of a chemical nature between these two substances. He had already given evidence on this point before the Departmental Committee of the Home Office which discussed the question of regulations for celluloid factories, and he had on that occasion described it as a mixture of camphor and nitrocellulose as distinct from a chemical compound. He had also criticised the statement that these two substances form a chemical compound in a report he wrote for the Colloid Committee of the British Association published in 1920, and that raised the question that cellulose did not have any camphor odour, which he also regarded as incorrect. There were many patent specifica-

tions in which the patentees claimed to have invented an odourless celluloid, and that was in opposition to the view of the Board of Trade that celluloid did not have an odour because the camphor and the nitrocellulose were in chemical combination. One of the normal processes in the manufacture of cellulose was what was called the seasoning process, which was designed to remove excess liquid solvent, and in it a considerable amount of camphor was also set free. Celluloid smelt strongly of camphor, and the reason why the smell was not so strong in the ordinary way as camphor itself was the fact that in the seasoning process, a skin formed on the outside of the celluloid through which the camphor could not evaporate so that the smell was not so strong, but if they scraped the surface of the celluloid, then the smell of camphor was immediately apparent. Neither did he agree with the contention of the Board of Trade that the properties of celluloid were very different from what would be the case if they were a mere mixture of camphor and nitrocellulose. The position with regard to a letter from the Home Office quoted by Sir Arthur Colefax was that regulations with regard to chemical works were being prepared, and in the schedule of the draft regulations was given a list of what were regarded as chemical works. His firm came under this schedule as regards the manufacture of nitrocellulose or cellulose nitrate from cellulose, that part of the manufacture being regarded as a chemical process. There was another section of the schedule which said that a process in which benzene was used was also a chemical process, and as his firm used toluol, which was a coal tar distillate, to some extent, in the manufacture of celluloid, they wanted to know whether the Home Office would regard that use of toluol as making the process a chemical process and consequently make the works a chemical works under this part of the schedule. The reply was that the Home Office did not regard the use of toluol in the manufacture of celluloid as being a use in the process of chemical manufacture. Personally he had no doubt whatever that natural camphor was not a chemical and as regards artificial camphor, to the celluloid manufacturer it was merely a material of construction for which purpose alone was it used industrially. It was not in his opinion a chemical. He believed there was a certain amount of a purified product used for pharmaceutical purposes. Camphor was sold in three qualities, viz., A quality, as supplied by the Japanese, which was practically pure camphor; then there was BB quality, or refined, which was the principal form of camphor which his firm bought and had a purity of 98 to 99 per cent. This was also a raw material which was sold to camphor refiners in this country who refined it for pharmaceutical purposes; and there was also a quality called B, which was crude camphor, and had a purity of about 95 per cent. As a general rule, the artificial camphor was rather below the Japanese crude in quality.

What "Chemical" Means

Asked as to what, in his view, the word "chemical" meant, Mr. Sproxton said he thought it meant a substance which was prepared by processes which involved a change of composition. A chemical compound was used as a material of construction, and was not a chemical. In the manufacture of celluloid, the camphor imparted to the nitrocellulose the property of plasticity or toughness, *i.e.*, mechanical properties.

THE REFEREE asked whether the plant for the manufacture of turpentine camphor was a specialised plant as distinct from a typical fine chemical plant.

MR. SPROXTON said it was in that a fine chemical plant was a plant which could be used for many purposes.

In reply to Sir Arthur Colefax, Mr. Sproxton said he could not agree that turpentine camphor was a synthetic body inasmuch as it had not been built up from its elements.

THE REFEREE, referring to the fact that rubber had been made synthetically, asked if it was to be held that all rubber was synthetic, whether made from the natural tree or not, because somebody had made it synthetically.

MR. SPROXTON said that the change from $C_{10}H_{16}$ (pinene) to $C_{10}H_{16}O$ (camphor) was not the kind of change he was contemplating when speaking of a synthetic process, because there was no addition to the carbon or to the carbon structure. There was an addition of oxygen. There was one attribute of synthesis which was important, viz., that they were building up with carbon atoms from substances which contained a few carbon atoms, and it implied an increase in the number of carbon atoms. That was a distinction between a building up and an ordinary chemical reaction. That was an attribute of chemical synthesis which was quoted in all chemical literature.

For instance, the formation of sodium acetate from acetic acid was not a synthetic process.

Cross-examined by Mr. Whitehead, the witness said the name turpentine camphor had been suggested for the purpose of this case in order to make things simpler and clearer. It was necessary to distinguish between three different things, namely, natural camphor; camphor manufactured from oil of turpentine; and what was truly called synthetic camphor produced by a true synthesis. At the time he suggested the description "turpentine camphor" he thought it was a new term, but he had since found it listed by Mercks under that name. He had also heard turpentine camphor referred to on many occasions as artificial camphor and there was a certain amount of confusion about it.

MR. WHITEHEAD said that as a general proposition, the name (applied to the camphor which the witness called artificial camphor, and the Board of Trade called synthetic camphor) was synthetic camphor, and that if anybody in the business referred to synthetic camphor it would be understood to mean turpentine camphor.

The witness agreed, but added that since 1909 there had been hardly any use of the term because Japanese camphor became cheaper and camphor made from turpentine dropped out. If anybody had sent him a sample of artificial camphor, he would have written back and asked what was meant in calling it artificial camphor. Dealing with the manufacture of turpentine camphor in the plant which his firm had erected, as mentioned by Mr. Merriam, the witness said it required two skilled chemists for thirty to forty workmen, one chemist being continually in the works to see that the process was carried out properly. Broadly speaking, nobody but Shering of Berlin had made a commercial success of the manufacture of camphor from turpentine. There was not very much difficulty in producing impure turpentine camphor. When Shering were told that it was not sufficiently pure, they set to work to make it purer, and that pushed up the price, and, generally speaking, he regarded the want of success in producing pure turpentine camphor to be due to economic rather than chemical reasons.

MR. E. PARRY said that whilst it was true that the term artificial camphor had been applied to pinene hydrochloride for many years, because it did resemble camphor in some of its properties, that term had now ceased to have any meaning, or to exist except as an academic description of what used to be, and in practice, pinene hydrochloride had, to all intents and purposes, disappeared. Natural camphor was never described in the trade journals as a chemical, nor was it described seriously as a chemical anywhere, and he should find it rather difficult to say that, because it was prepared artificially and was identical with natural camphor, it was a chemical. It was true that it was made by chemical reaction, but it had no reactive properties whatever and its only chemical attribute was that it was the result of a chemical reaction. He agreed with the previous evidence as to the statements made by the Board of Trade. Coming to the question of trade usage, he pointed out that camphor was often quoted with essential oils because it was the predominating part of an essential oil. Sometimes it was quoted under a separate heading as in the list by Sparks, White & Co., but in the majority of chemical catalogues it was mixed up with other substances like charcoal, &c., without any classification at all.

The hearing was adjourned till April 7.

Decision on Liquid Sulphur Dioxide

The following is the decision of the Referee in this case, the hearing of which was reported in our issue of April 1:—

I have had some difficulty in coming to a decision in this case, but after a very careful consideration of Mr. Boake's contentions the conclusion to which I have come is that I cannot hold that liquid SO_2 has been improperly excluded from the list of dutiable substances.

In the contact process for making H_2SO_4 , the SO_2 gas coming from the roasting furnace has to be very carefully purified, otherwise the catalytic platinum becomes poisoned. This purification is a matter of difficulty. There is thus produced SO_2 in gaseous form and of considerable purity. It is, however, mixed with air, and contains a little SO_3 . These are not impurities for the purpose of the manufacture of H_2SO_4 . This sulphur dioxide is not a fine chemical, nor, of course, is the H_2SO_4 produced from it. For the purpose of making liquid SO_2 , the SO_2 gas is first freed of any SO_3 that may be present, and is then passed into water for the purpose

of freeing itself from its diluent air. The water is warmed, but gas comes off free of air, and is then dried and pressed. The question is whether this further purification and treatment, *i.e.*, the getting rid of the SO_3 and the diluent air, has turned the heavy chemical, *viz.*, SO_2 gas into a fine chemical. I cannot bring myself to think that it has. The real difficulties of purification have been already overcome in producing SO_2 gas. I do not think that the elimination of the small quantity of SO_3 present in the SO_2 gas, and the passing of the gas through water, puts the product into a different category. I think that the trade which regards SO_2 gas and H_2SO_4 as heavy would also regard liquid SO_2 as heavy. The classification of a chemical as fine does not depend merely upon the degrees of purity attained. Not being satisfied that the substance in question has been improperly excluded from the list of dutiable substances, I hold that the complaint fails.

Complaints Under Section 1 (5)

The Board of Trade have received a formal notice of complaint under the above Sub-Section that the following articles have been improperly included in the lists of articles chargeable with duty under Part I. of the Act :

Re-agent bottles.
Hydrometer jars.
Museum jars.
Specimen jars.
Surgical jars.
Cylindrical measures (bell-shaped).
Conical measures.

Any persons directly interested in this case, which will be heard shortly, are asked to communicate immediately with the Board of Trade, Industries and Manufactures Department, Great George Street, London, S.W. 1.

Dyestuff Research and Medical Science Important New Developments

At a meeting of the Manchester Section of the Society of Chemical Industry, held at the Manchester College of Technology, on Thursday, March 30, an important paper on "The Relation between Chemical Constitution and Antiseptic Action in the Coal Tar Dyestuff," was presented by Thomas H. Fairbrother, M.Sc. (Vict.), A.I.C., and Arnold Renshaw, M.D. (Lond.), D.P.H. (Manc. and Cantab.). Mr. John Allan presided, and the large lecture room was crowded.

THE CHAIRMAN, in introducing the authors of the paper, said that the very close association which existed between good health and the world's welfare would have been sufficient excuse for a very considerable number present that evening, but when, with that interest, there was associated the fact they were to have brought to their notice the connexion of what might be called a prime chemical industry with health welfare the matter became even more important. Matters would be introduced to them from a point of view which would cause them to feel that chemical industry was something more than merely the manufacturing of chemicals, and that it reached into fields of very much greater extent than many of them had thought.

Pathological Side of the Subject

DR. RENSHAW, in dealing with the pathological side of the paper, stated that he must correct an unauthorised impression which had been created. There was no connexion between the subject-matter of the paper and antipyretics, diuretics, sweetening matters, &c., as stated by a certain gentleman in interviews on the subject. While the authors of the paper believed that the gentleman in question was actuated by a desire to give publicity to a subject which the authors believed to be of great scientific interest, yet he had unfortunately created an impression which was quite erroneous, and which would not have been created if he had seen the authors of the paper before making his statements.

The whole field of medicine was then briefly but comprehensively reviewed so as to show in correct perspective the work which the two collaborators have been doing. It was pointed out that the intoxications resulting from infective processes were probably responsible directly or indirectly for nine-tenths of the suffering and misery consequent upon the ravages of disease. Thus the greater proportion of heart and lung diseases are bacterial in origin. Rheumatism was due to a toxin derived from organisms growing possibly in remote organs; peritonitis, pleurisy, and meningitis presented a definite bacteriology. When, however, disease was recognised by its cause rather than by the organs affected, then the truth of the statement became clearer; thus, streptococci, for instance, could produce inflammation of many organs.

The infective diseases could be classified roughly into :—

- (a) Those with unknown infective origin, such as chickenpox, measles, scarlet fever.
- (b) Parasitic infections by the protozoa, causing such diseases as malaria, sleeping sickness, or dysentery, and the metazoa, such as flukes, filaria, and worms.
- (c) Bacterial and fungal diseases, such as actinomycosis, anthrax, diphtheria, tuberculosis, "Septic infections," typhoid, and many others.

In all, some fifty specific diseases were mentioned by Dr. Renshaw, and the causative agent was not yet discovered in twelve of them. Of the remaining thirty-eight a partially successful curative agent was available in ten. There were thus twenty-eight diseases in which the causative agent was known in which there was as yet no "direct attack" method of treatment. To these must be added the twelve diseases of unknown causation, since they were known to be infective. There were, therefore, forty important diseases for which it could truthfully be said that no real curative agent existed apart from the body resistances.

When a person became ill it was by the toxins resulting from the rapid proliferation in the blood or tissues of the bacteria or parasites responsible for the attack. In the case of a bacterium each microbe could potentially divide, under favourable conditions, so frequently that from a single bacillus within twenty-four hours many millions could be obtained. At the same time the body tissues were producing specific anti-bodies which tended to kill off that one type of organism and that one type only. After an attack the blood was richer in these anti-body substances; hence the immunity for a time from further infection. It was hoped to prepare in the laboratory perhaps on a much coarser scale, chemical substances which should have a similar direct action on infecting agents. These substances must not be harmful to the patient, although highly lethal to the infective agent. Ehrlich had expressed this in a flash of genius in the words "Parasitotropic but not organotropic." When an infection occurred three possibilities arose :—

1. The organism was rapidly killed off by the chemical anti-bodies and cells in the blood.
2. The organism killed the patient. A toxin was quoted which could kill a living mass of tissue 250,000 times heavier than itself.
3. A gradual balance was established, in which the infection became localised, but from time to time the body became flooded with toxins causing chronic ill-health.

There were two methods of fighting such an infection :—

1. By coaxing the body itself to fight the infection by means of rest, warmth, &c.
2. By injecting into the blood chemical substances having a chemical affinity for the infecting agent which could kill that agent quickly and cleanly without harming the tissues and organs of the body.

Present Work Described

The present work had been a study of these chemical affinities. Fourteen of the commoner organisms had been employed in the work and certain protozoa. These were B. Phloei, B. Subtilis, B. Anthracis, B. Diphtheriae, Streptococcus, Staphylococcus, B. Coli, B. Dysenteriae (Shiga, Flexner, and Gaertner), B. Typhosus, B. Paratyphosus A, B. Paratyphosus B, B. Lactis. Of the protozoa an actively mobile paramoecium was used and occasionally certain flagellates. These organisms had been tested with different dilutions of the various dyes used. As a result a mass of useful information had been accumulated, some of which could probably be of immediate application, and some of which would require further development before final application could be adopted.

The solutions of the dyes to be tested were obtained in the following manner. One gram, of dyestuff was dissolved in 100 ccs. of distilled water, and this provided the stock solution, which was kept in glass-stoppered bottles waxed over. Only small quantities were prepared at a time, fresh solutions being made up as required. The stock dye solution 1/100 to be tested was then added in bulk to a known volume of broth to make 1/500, 1/1,000, 1/5,000 of the dye in sterile broth prepared from animal tissues. This dilution of dye in broth was then added in quantities of 8 ccs. to sterile plugged tubes, and these were finally sterilised at 30 lb. pressure for thirty minutes, except in a few cases where the dye was decomposed by heat, when special precautions had to be taken, and sterility tests made prior to inoculation. These dye-broth tubes were then inoculated with a large loopful of a recent culture in broth of the organism, and incubation carried out at 37°C. for two days, after which sub-cultures were made into broth, or, in the case of the coli-typhoid groups or to lactose, or mannose-fuchsin peptone water, when a further incubation of forty-eight hours of the sub-cultures was again made.

The results were shown in certain tables exhibited, and indicated that certain dyes killed off the gram negative organisms, leaving the gram positive as in chrysoidine, 1/1,000. Others killed off the gram positive, leaving the gram negative as in Neutral Red, a fact which helped the authors to separate some of these organisms when mixed together as in the examination of stools for typhoid.

Following the bacteriological observations the behaviour of protozoa was examined. For this purpose a culture of paramoecia was used. A hanging drop preparation of dye and paramoecia was observed suspended over a brass ring fixed to a slide by vaseline, and consequently the behaviour was examined in a suspended drop without any external pressure impeding the movements of the organisms, and also obviating the alteration of concentration of the dye owing to drying up.

Dr. Renshaw then proceeded to deal with the process of the elimination of dyestuff. All the dyes were put up in a 1/100 solution in fresh tap-water. A certain volume of the paramoecia culture was drawn up to a mark on a capillary pipette, and an equal volume of 1/100 dye solution drawn up, an air bubble separating the two liquids. The two liquids were then discharged as a drop on to a cover slip and the time of mixing noted. This gave a 1/200 solution. An immediate examination was then made, and after fifteen minutes a further examination. If, after fifteen minutes' contact with the 1/200 dye solution, any organisms were still alive, the dye was rejected. If, after fifteen minutes' contact with 1/200 dye solution, no living organisms were detected, that dye was referred for further examination at greater dilution. The next dilution employed was 1/1,000 solution of dye mixed with equal volume of paramoecia as before, giving a 1/2,000 solution. This was subjected to the same time exposure as before, and if living forms, after fifteen minutes, were present in solution, that particular dye was rejected, and if no living forms were detected after fifteen minutes the dye was put up in the next dilution of 1/20,000. The observations made were tabulated in certain tables exhibited.

An analysis of the result showed that the dyes which showed the greatest action on the paramoecia were: Nile Blue A, Nile Blue 2B, Meldola Blue, Auramine O, Ethyl Violet, Malachite Green Oxalate, and Magenta Acetate.

In the above cases the forms were affected at once at a dilution of 1/20,000, and some dead forms noted. Auramine O, Ethyl Violet, Malachite Green Oxalate, and Magenta Acetate were all very active in the case of bacteria, but the oxazines were only active amongst the gram positive organisms. In regard to the work on paramoecia, the readers of the paper had eliminated the whole series of dye classes except the triphenylmethanes and oxazines. The triphenylmethane group were highly bactericidal, but in the oxazine group bactericidal action on the gram negative (intestinal) organisms was very poor, and in the case of Meldola Blue scarcely any bactericidal action was present, whereas paramoecia are killed off by it in a dilution of 1/20,000 in fifteen minutes, and at a much higher dilution after longer contact.

Thus certain dyes showed a selective action which would be useful. One of the difficulties associated with the activated sludge process of sewage purification lay in the fact that the protozoa after a time increased too rapidly in numbers and presumably ate up the bacteria responsible for the purification process. Several dyes had been discovered which could kill the protozoa in high dilution (1/20,000) without harming the bacteria.

An Interesting Experiment

As an instance of the way in which the knowledge now gained could be utilised an interesting experiment was quoted. The authors wished to test certain dyes on the worms present in the blood in a patient suffering from filariasis, a tropical disease for which no cure exists. They were put in touch with two cases who presented themselves for examination. The first patient was examined, and his blood found to contain the tiny moving worms present in the blood in this condition. A solution of a dye was made and mixed with the patient's blood until a dilution of 1/4,000 resulted. The blood was again examined and the filaria were seen to be still moving, but within five minutes of mixing the dye with the blood they became dead and stiff. The whole experiment took fifteen minutes to complete, and within this time the patient had the satisfaction of knowing that at least one substance existed which had a lethal action on his parasites. It was believed that this drug might possibly be administered intravenously.

Similarly some of the more powerful dyes were being tested out as antiseptics on the human being in regard to suppuration in the nose and in the eye, and arrangements were being made for their action in cases of gonorrhoea being noted. In this work eminent surgeons were collaborating. Animal experiments were also being conducted to ascertain which dyes might be given intravenously.

In regard to syphilis, Ehrlich had produced a substance—salvarsan and neosalvarsan—for the treatment of this disease. The authors had tested neosalvarsan in a dilution of 1/200 against one of their test protozoa, and found them to be alive even after two hours' immersion in this solution. Dyes have been obtained which killed this same test agent in a dilution of 1/2,000 instantly and 1/20,000 within fifteen minutes. Mixtures of dyes had been tested, and even this range had been increased, action being observed up to a dilution of 1/80,000 instantly, and up to 1/160,000 within fifteen minutes.

In addition to the foregoing chemical applications and to the sewage application, there were possibilities of antiseptic action, and of these substances being employed in connexion with certain foods and beverages such as milk. Arrangements were being made for carrying out large-scale operations at sewage works, and in the case of protozoa and bacteria they had endeavoured to enhance the lethal action by trying double compounds of dye with metallic salts. It had been found that the zinc chloride combination was more powerful than the dye acting alone or than the equivalent amount of zinc chloride acting alone.

Chemical Research

MR. FAIRBROTHER then dealt with the subject-matter of the paper from the point of view of the technical research chemist. He said that with regard to the purely chemical side of the subject the central idea which the authors have had in mind had been the actual part played by different chemical groups in antiseptic action, amongst the various classes of coal tar dyes. The work has covered broadly the whole range of coal tar colours, and antiseptic action has been studied in the following classes of dyes: Azo class, triphenylmethane class, phthaleins or pyronines; azines, including oxazines, safranines, thiazines, eurhodines, and acridines. In short, all the dye classes whose members were water soluble. Representative members of each class had been studied in their action on fourteen common organisms and also their action on living protozoa.

The results showed that there were certain classes which had a greater or less tendency to antiseptic action, such as the triphenylmethane class, the safranine class, and the acridine class. The azo class as a whole showed very little antiseptic action. In each group there was an internal variation of antiseptic action, which action can be controlled by varying substituent groups in the type molecule. Thus, in the triphenylmethane class certain strongly basic dyes, such as crystal violet and auramine, &c., showed very strong antiseptic action, whereas others such as the patent blues, acid greens, turquoise blue, and victoria blues showed very little action. This was due to the fact that in the latter type different groups were present on the nucleus, which removed the antiseptic properties manifested by crystal violet itself. These groups included naphthalene sulphonic acids, hydroxy naphthalene sulphonic acids, nitro bodies, and hydroxy bodies. One of the main conclusions was that the best antiseptic action was shown by the simpler types of any group which had a strongly basic character.

Mr. Fairbrother then dealt with the selective action of certain dyes as previously mentioned by Dr. Renshaw. While chemical constitution undoubtedly played a big part in antiseptic action, and while the presence of certain groups in the molecule could prevent antiseptic action being shown, there were probably other factors to be considered as well. Most of the dyes showing antiseptic action diffuse rapidly through parchment, and belonged to the class of substances known as molecular dispersoids, whereas those which did not show much antiseptic action from jellies or colloidal solutions. It is possible that the rate of diffusion of the dyestuff into the cell membranes has much to do with the problem, and the choice of antiseptics must be governed by these considerations. A further important point established by the authors was that where a dyestuff exhibited antiseptic properties these properties could be augmented by the introduction of a metallic salt of the same acid as the dyestuff into the molecule of the dyestuff as a double salt. Thus the double salt of zinc chloride and crystal violet chloride was a more powerful antiseptic than either crystal violet chloride itself or zinc chloride itself. The amount of zinc chloride present was insufficient of itself to have any effect on the organisms, as was shown by actual experimental work with zinc chloride alone or the organisms.

Having dealt with the different groups of dyestuffs in great detail, and shown how antiseptic action varied with chemical constitution in each separate group, Mr. Fairbrother stated a few general observations.

As a general rule, he said, dyes which showed any marked antiseptic action amongst bacteria and protozoa contain one or more amido groups in the molecule. The presence of amido groups was not enough to cause antiseptic action, but the absence of amido groups was enough to prevent any decided antiseptic action. The effect of amido groups in the molecule could be modified and even completely neutralised by the presence of certain other substituent groups in the molecule, such as sulphonic acid, carboxylic acid groups, nitro groups, substituted naphthalene or naphthylamine groups, or by further alkyl or aryl substitution in the amido groups themselves or alkyl substitution in the benzene nuclei.

Antiseptic Action

In seeking for a possible explanation of antiseptic action it was probable that other factors than mere chemical structure would have to be studied, because at the best the chemical formulas assigned to chemical bodies were but rough approximations to the truth. Two observations were worthy of notice; in every case where decided antiseptic action was manifested tautomeric change in the molecule was possible, and also in every case of active antiseptic action the dyestuff was a molecular dispersoid, while those dyes forming colloid solutions showed very little tendency to antiseptic action. It was also a possibility that antiseptic action was dependent on the formation of a compound between the dye base and the cell molecules of the organism. It must be remembered that the dyes showing antiseptic action were basic dyes, and there was a parallel to this in the action of basic dyes on animal fibres like silk. Knecht had shown that when silk was placed in a solution of rosaniline hydrochloride the silk replaced the hydrochloric acid, the acid was set free, and was found in the excreted liquors, and the silk and the rosaniline base formed a compound together. If this view was correct, the compounds of dye and organism should conform to the chemical laws of constant composition, and the establishment of this would be a difficult practical problem. It was possible that the principle of the law of mass action could be applied, and that an equilibrium was set up, a balanced action which did not proceed to completion in either direction, but whose course was controlled by the active mass of either component of the system. Thus, whilst antiseptic action depends to a remarkable degree on chemical constitution, and while it was true that certain fundamental groups of atoms favoured antiseptic action and others prevented it altogether, it was not possible to formulate any general rule to connect antiseptic action with intensity of colour. Similar to Nietzsche's rule, antiseptic action did not vary with the molecular weight, and there was no simple generalisation similar to Armstrong's quinonoid theory for explaining antiseptic action. The nearest parallel was Witt's chromophore generalisation which could be applied by saying that certain groups favoured antiseptic action, and the action could be augmented by the addition of other groups. This, however, was vague, and did not help very much.

The relationship between chemical constitution and non-antiseptic action, however, was more clear. The discussions of the various groups showed how antiseptic bodies had been rendered non-antiseptic by the replacement of certain groups by others. These findings, said Mr. Fairbrother, would be of great use when they came to explore more intimately those fields which has shown promise so far. Although they had only touched the fringe of a vast subject, yet they realised how important it was for pathology and chemistry to go hand in hand in the war against disease, and in the search for weapons with which to fight the unseen enemies of man.

Certain demonstrations were then given of the action of dyestuffs on living protozoa. This was done by means of a very powerful micro-projector. In the case of paramoecia the lethal action of the dyestuff was clearly indicated. Samples of blood were also taken from two patients in attendance who had volunteered to come forward for the purpose, and the minute filaria organism characteristic of the tropical disease known as filariasis was shown in motion on the screen. An endeavour was made to show the action of the dye Auramine O on the organism, but the demonstration presented difficulties which, in the circumstances, the authors of the paper were not able to overcome.

A very long discussion followed, in which the Chairman, Dr. Herbert Levinstein, Dr. Henderson, Dr. Rowe, and Messrs. Amies, Rosenbaum, Browning, and Bainbridge took part. A hearty vote of thanks was unanimously accorded the authors.

German Dyestuffs

To the Editor of THE CHEMICAL AGE.

SIR,—Re your comments on Sir W. Barton's recent statements against the Dyestuffs Act, and your remarks about the old German monopoly, as one who has been in the colour trade for at least twenty years, may I point out to you that contrary to what you claim, the Germans had no general monopoly in the colour trade in pre-war days. The Swiss industry was by no means a small one, and the Germans never attempted to put it out of existence. You overlook the fact, too, that prior to the war the British Alizarine Co. had a steady trade, and had been in existence for two or three generations. You overlook the fact that the firm of Levinstein, Read Holliday, and the Clayton Aniline Co. were also in existence, and there were also a few not unimportant firms in America. One must, of course, agree naturally that the Germans had developed the industry most. Prior to the war, excepting by keen business organisations and methods, the Germans did not attempt to build for themselves a monopoly, and their previous methods will undoubtedly control their future methods.

Prior to the war the great German firms were seriously competitive one with another, and the efforts of other nations to establish colour industries have forced them to combine into the great I.G. in self defence.

You overlook the fact that behind Sir W. Barton's remarks and actions is the knowledge that the British colour industry depends upon the textile industries, and these by the influence of the Dyes Act are being seriously menaced. We are following the shadow and missing the substance.—Yours, &c.,

PRO BONO PUBLICO.

Manchester, April 5.

Affairs of a Chemical Exporter

THE first meeting of creditors of Mr. L. J. Colley, described in the receiving order as the Colley Engineering and Machinery Co., 17, Surrey Street, Strand, London, was held on Monday at Bankruptcy Buildings, Carey Street, London. The debtor had stated that he had exported chemicals, perfumes, and machinery, the two former being shipped under the style of Colley Freres. No statement of the debtor's affairs had been submitted, but the liabilities were roughly estimated at £2,575, while the assets were valued at £1. During the first twelve months the debtor estimated that the business would result in a loss of £1,000, which estimate proved to be correct. During the ensuing twelve months the turnover increased to £37,446, and the net loss was only £323. In the early months of the third year's trading the slump in trade began, and he was compelled to refuse orders because the bankers would not negotiate the documents which were dishonoured by overseas importers. There was no proposal before the meeting for the payment of a composition, and the case was left in the hands of the Official Receiver.

The Society of Dyers and Colourists

Annual Meeting and Dinner in Manchester

THE annual meeting of the Society of Dyers and Colourists took place in Manchester on Friday, March 31, and the preliminary proceedings were opened at the College of Technology, Professor E. Knecht presiding over a very large meeting.

Artificial Silk Industry

Professor E. Bronnert, Ph.D. of Strasbourg and Mulhouse, who is a manufacturer of very large quantities of artificial silk, gave an extremely interesting and instructive address upon the progress made in the artificial silk industry. Professor Bronnert said that the history of the artificial silk industry, that is to say the various processes by which it had evolved, was too well known to require further detailed repetition, but perhaps a short *résumé*, by way of introduction, would not be considered out of place.

The idea of producing practically artificial fibres which might, perhaps, some day supplant those of the silkworm was due to Count Hilaire de Chardonnet, who had been called the father of the artificial silk industry. To him they owed the nitro-cellulose process which he published in 1884. This process was the first to be used on an industrial scale, and was prevalent throughout the nineties. The close of the Nineteenth Century saw the industrial adoption of the cuprammonium process by Bronnert, Fremery, and Urban. Following hard upon these two processes came those of the viscose and more recently the viscose improved processes.

The use of artificial silk might be said to be as yet in its infancy, and from day to day fresh uses were discovered for its products. They tended to increase as cheaper processes were evolved. The silk, as originally manufactured, owing to this factor of cost, had only been able to be used to advantage along with other textile fibres, such as cotton, and in those cases the fibre preponderating had not been the artificial silk. It was only now that artificial silk alone was being used in the manufacture of articles on a large scale. The present fashion had been of much use to the industry, for it had been possible to use the silk in the manufacture of ties, jumpers, stockings, underclothing, and articles of a similar nature, without the admixture of other fibres.

A New Step

A new step had been taken in the production of artificial viscose silk. Until now artificial silk, for a variety of reasons, had only been produced of a count varying from eight to ten deniers, while the double thread of the silkworm was of two to three deniers. It had always been a complaint among consumers of artificial silk thread that manufacturers appeared to be unable to place a thread of the fineness of natural silk on the market. A French inventor and artificial silk manufacturer had now supplied this need in a most remarkable manner.

Colloidal solutions of cellulose, like viscose, were spun by the well-known process of forcing them through fine apertures. The apertures were required to be smaller in the case of a fine thread and larger in the case of a coarse thread. More concentrated solutions of cellulose were required to obtain stronger threads. Concentrated solutions of cellulose, on the other hand, required narrower openings because of their high content of cellulose. However, the difficulty in filtering the solutions in order to prevent a rapid choking and the boring of the apertures, as well as the increased pressure required, were all causes of an irregular spinning, and operated therefore against a higher concentration. Hitherto an average good spinning of eight deniers has been accomplished, with a solution containing 8 per cent. of cellulose, and with apertures of 0.1 mm. diameter. The employment of finer apertures occasioned only more difficulties, and among other attempts, one of drawing off rapidly the thread as it was produced and of a less feed of viscose to the nozzles, proved quite unsuccessful. Many were the attempts made to solve this problem of the fine thread.

Now, however, it had been shown that under certain conditions threads of two to three deniers and less might be spun with the greatest regularity and ease. The same size of apertures might still be used, and the same maximum spinning speed of 45 metres per minute continued. The two factors of this important improvement were the feed

of viscose to each aperture in relation to a unit of time, and a minimum percentage of acid different for each count was necessary in the spinning bath. Below this minimum, spinning of this count was impossible. It was well known that a rapid exhaustion of the acid-spinning bath took place in the case of the former eight deniers threads, when the flow of the alkaline viscose running through an acid bath had neutralised the acid to a greater or less degree. But until now it had not been known that for each count a special and strictly limited minimum concentration was required, in conjunction with an appropriate feed, and that it was possible to retain the usual nozzle of 0.1 mm. by using, for example, the ordinary viscose as used by ripening the alkaline cellulose first and then the viscose solution itself to a certain degree of maturity. In this new process for fine spinning, maintaining the minimum concentration for each count was so important that no lower count could be spun with regularity than that of the particular thread for which it is adapted.

There was a certain relation between the counts of the single thread and the concentration of the acid in the spinning bath, and this had been reduced to a rule and named by Professor Bronnert the "Square Root Law." The square roots of the different counts were inversely proportional to the concentration of the acid in the bath. The minimum concentration for an eight deniers thread was, as already known, 140 gms. of monohydrated sulphuric acid per litre. For this new spinning process no change need be made in machinery and the output remained unaltered, and any count might be spun with the apparatus by the mere conforming of conditions according to the square root law.

Brilliancy in the fine counts might be varied at will and without any damage to the strength of them. To reduce brilliancy and to obtain an opaque thread it was only necessary to lower temperature, whereas by raising the temperature to 40° or 50° C. a thread of more and more brilliancy was produced. The new viscose had a very soft touch and a much increased covering power; it dyed evenly, and when woven did not easily crease.

Recovery of Products

Methods had been put forward for the recovery of the products in the viscose process. In the cuprammonium process a recovery of about 90 per cent. of the ammonia and 95 per cent of the copper had been effected without excessive expense. The soda lye in the viscose until now had been wasted, after having been neutralised by the sulphuric acid of the spinning bath. It had been suggested to recover sulphate of sodium from the spinning bath by cooling it, and so causing a dissociation of the bisulphate in the spinning bath into neutral sulphate and sulphuric acid. This method, however, was faulty and most expensive. The fact was that the sulphates produced did not remain in the spinning bath, but were formed only on the threads emerging from it and received on the spools or the like. Threads, as a rule, were only slightly acid when the acid had penetrated the thread and entirely neutralised the alkali of the viscose. In washing with water the process of removing the neutral salt from the inner parts of the threads took a long time and much water was required. The finer threads required a more acid salt bath and acid and salt have to be added continually. In the new Bronnert process water acidulated with sulphuric acid was employed to such an extent that all sulphate in the threads was converted into the readily soluble bisulphate, which might easily be washed out on the addition of more sulphuric acid.

After using the same restricted quantity of acidulated water twice an equilibrium was produced between the contents of bisulphate in the threads and that in the liquid. A further washing would not extract more of the salt, and so the threads were squeezed out and the liquid falling from them collected. After concentration to a certain degree the hot strong acid bisulphate of soda was added again to the spinning bath, instead of adding fresh sulphuric acid and neutral sulphate or bisulphate as was formerly done. This process had proved most economical and gave the best result, when mixed ammonium and sodium salts were used together with the spinning bath.

A spinning bath of pure acid yielded threads with an irregular round cross section. The same occurred when acid was in excess over salt in the spinning bath. The section

differed completely when the salt was in excess and produced the form of a star with serrated outlines. If the salt was in great excess the thread appeared to be coagulated more slowly and took the form of a bean, the serrated outline being, nevertheless, maintained. It was caused by a shrinkage which forced the water out of the inner parts of the thread into the surrounding salt solution. It was possible to observe from these characteristic forms which process had been used in the spinning, and it was as well most important for the specific lustre of the thread. The angular bulbs acted like prisms to the light and increased or decreased the transparency of the threads. A higher temperature of the spinning bath hastened the plasmolytic process, shrinkage took place in a different way, and different effects were produced. In spinning from ammonium salt with a little acid, threads were produced of a perfect round circumference, and although these might have a slightly less covering power they were of even transparency and brilliancy, and of the highest tensile strength, which made them suitable for use in braids and the like.

Variation in Strengths

A great variation has been found in the strengths of even first-class artificial silks, especially when dry. This might be caused by the irregularity of the cross sections and to a defective spinning, and might be brought about in the following way. It had been found that the apertures became choked not only when impurities owing to bad filtering were in suspension in the viscose, but also when the minimum concentration necessary for the special counts did not exist at each aperture. This became worse when some of the apertures were choked, the other apertures producing coarser threads owing to the additional feed of viscose. It was most important, therefore, to have the bath circulating and of constant composition and temperature. In the best silk resulting from one kind of viscose, when all the spinning factors were carefully arranged, the filaments all show the same even section. This might be realised in the acid wet spinning process with the greatest ease and better than in the Chardonnet process when spinning collodion direct into hot air.

The short fibre received fresh impulse by the above described improvements of Professor Bronnert. It might be spun to any count, and when it was fine might be mixed with chappe to a certain degree or might be spun alone with a yarn resembling chappe yarn. These yarns at the same weight naturally exhibited a greater volume than the hanks of artificial silk yarn even when they were of the same count. Although the lustre partly disappeared during the combing operation, articles manufactured from the new mixed or unmixed yarns had a remarkable "feel" and brightness, and if possible to be produced at a low price and on a large scale they might prove of great assistance to the textile industry.

Processes had been further cheapened by another Bronnert process. It was a well-known fact that the usual way of drying gelatinous freshly precipitated and washed cellulose threads had to be carried on with extreme care. When the threads were placed too near to the steam pipes or radiators, producing the higher temperature, the threads became brown, and the cellulose was altered, which meant that only relatively low temperatures could be employed, and, of course, the drying process took much longer. Much room was required, and the cost for fuel was excessive. Until now the drying temperatures employed scarcely exceeded 60°.

It had been suggested to remove the water which was supposed to be chemically combined with the cellulose by steaming the threads, but this was a very tedious process. It had now been pointed out that the same gelatinous threads when well washed from the salts and from the acid might be exposed to hot air up to 140°C. without becoming brown or producing an unevenness in dyeing afterwards, provided that care was taken that the air circulating at any place in the drying chamber maintained an equal velocity so that no warmer or cooler parts, caused by the evaporating water, existed in any section of the drying chamber.

It made no difference if the temperature were not the same from one cross section to another, which might quite easily happen when the hot air became more and more saturated with water, and consequently cooled, but it was the usual practice to keep the air at the same temperature as when admitted by reheating it from time to time in its passage through the drying apparatus.

The escaping air at the end of the process was practically at the same temperature at which it entered and contained the maximum amount of water compatible for complete drying. It must be obvious to anyone knowing the great dissolving

power of air, which became the more so with an increasing temperature, what a great economy of fuel must take place when less air at a higher temperature required heating for a relatively short time in the drying process. These improvements were of special significance for short fibre which must be produced at a low cost on a very large scale if a constant market were to be created.

A long discussion ensued, in which Messrs. Knecht, Dreaper, Copley Smith, and others took part.

On the motion of Mr. H. Sutcliffe Smith, president of the Society, seconded by Mr. William Marshall, a hearty vote of thanks was passed to Professor Bronnert for his paper.

Annual Meeting and Dinner

The annual meeting was held at the Midland Hotel, Mr. H. Sutcliffe Smith, President of the Society, being in the chair. Mr. Smith was re-elected President of the Society, Professor E. Knecht, Mr. E. Hickson, and Mr. F. J. Farrell were re-elected Vice-Presidents, while Mr. H. Jennings, Professor A. G. Perkin, and Mr. F. E. Craven were re-elected members of the Council. Mr. J. R. Denison, Mr. A. Silverwood, and Mr. W. P. Thomson were re-elected honorary treasurer, honorary secretary, and honorary patent agent respectively.

The annual dinner also took place at the Midland Hotel. Mr. H. Sutcliffe Smith presided, and there were 170 guests present, including Sir Philip Lloyd-Greame, M.P. (Department of Overseas Trade), Mr. Clare Lees (President of the Manchester Chamber of Commerce), Sir William Alexander (British Dyestuffs Corporation), Mr. Percy Ashley (Board of Trade), Col. F. R. McConnel (President of the Textile Institute), Dr. M. O. Forster (Dyestuffs Development Committee), Sir Harry V. Kilvert (Chairman of the Dyestuffs Licensing Committee), Mr. W. J. U. Woolcock, M.P. (Chairman of the Dyestuffs Development Committee), Captain James Moir (of the College of Technology, Manchester), Mr. E. V. Evans (Dyestuffs Licensing Committee), Dr. H. Levinstein (British Dyestuffs Corporation), Dr. A. Rée (Manchester), Dr. Bertram Prentice (Principal of the Royal Technical College, Salford), Mr. W. Graham (Board of Trade), Mr. B. Mouat Jones (of the College of Technology, Manchester), Sir Joseph Turner (British Dyestuffs Corporation), Dr. E. Bronnert (Manchester), Professor E. Knecht, Dr. F. M. Rowe, W. G. Wilson and Mr. J. B. Atkinson (secretary).

Sir P. Lloyd-Greame, M.P.

Sir Philip Lloyd-Greame, M.P., proposed the toast of "The Society of Dyers and Colourists," coupled with the name of the President. He said that he found himself in the company of the real and original "dye-hards." Among the scientific institutions of the country the Society held, by right and reputation, a very high place. He knew something of the work which it had undertaken in the past, and of its value, and he had some idea of the work which it proposed to undertake in the future. Apart from the vital importance of the industry in time of war it appeared that there was hardly a single ill to which flesh was heir which could not be cured by the administration of dyestuffs. The industry carried a great responsibility upon its shoulders, and it had a great future before it. Through the auspices of the Society the makers of dyes and the users of dyes met upon a common ground, studied common problems, and pursued a common purpose. The great difficulty which confronted the members of the Society, as it confronted all other men, was the need of a real and lasting peace throughout the world. Men wanted to know when they entered upon an enterprise that the course was clear and plain right through to the end of that enterprise. The exchange position of European countries was not the cause of their difficulties. The time was ripe when men should disabuse their minds of the fallacies which grew up from day to day. One fallacy was that there was any short cut to prosperity and to the redemption of the world. There was none. A second was the fallacy of an exclusive nationalism. The world had to learn that an exclusive nationalism was neither practical, patriotic, nor did it pay. There was a complete interdependence of one industry upon another. There was also a complete interdependence of nations upon one another. It was no use trying to live in watertight compartments. People also spoke amazingly loosely about the creation of credit, as though it was merely a form of outdoor relief. In the long run, credit really meant that the investor had to invest his savings. What they had to bring home to the world was that if credit was needed the conditions which breed credit had to be operative. Nations could then produce

commodities in return for the credit which could be granted them. It was idle to talk about the artificial creation of credit to people who had neither the capacity to pay nor the will to pay. The lack of markets was the root cause of the whole trouble. No one was able to buy unless at the same time he could sell. Buying power meant one thing and one thing only; that the man who bought was also producing. It was the general interchange system of the world which enabled him to buy, otherwise the goods he was sending out were merely a form of outdoor relief. He had been moved to say some very obvious things, and he did not know whether anyone would be rash enough to record them. He hoped that the Genoa Conference (in which he had great faith) would enable the world not only to see the obvious but to do the obvious. If it succeeded in doing this it would achieve a service which no other Conference had as yet achieved. Sir Philip Lloyd-Greame concluded by a reference to the services of the President in bringing about a complete reorganisation of export credits and the establishment of an Austrian clearing house which was working effectively at the present time.

The New Colour Index

The President, in responding, mentioned that the work of the Society had been much appreciated by the Department of Scientific and Industrial Research, as was shown by the fact that from 1917-1920 inclusive they had been allotted £1,125, and for every £1 so allotted the Society had put down a similar amount, and also an additional £914, making a total of £3,164. This money had been applied in the furtherance of research work, and it had been well said by one authority "that they had delivered the goods." The amount, however, was much too small for such an important work, though it had been very wisely and economically expended. Lately, they had been informed by the Department, he believed much to their regret, that they could not see their way to continue the grant, owing to the fact that they had had to divert their funds largely to the big Research Associations. He would like to appeal to the Department to reconsider their decision. The work in hand was of extreme importance, not only to users but also to makers, as it independently supplemented their efforts. It would be a very great mistake to allow the scientific brains of the Society to lie dormant as regards research merely for the want of a very small sum of money. He threw it out, as a feeler, that the big dye manufacturing firms, who had had large grants for research from the Government, might consider the possibility of diverting a little of this money to enable their Society to continue such useful work.

An enterprise lately undertaken by the Society took the form of issuing a much wanted Colour Index. The whole trade, makers and users alike, had so far had to rely for any information on the structure and properties of dyes on the out-of-date German Schultz Colour Tables issued in 1914. Great progress had been made already with this Index, thanks to the initial enthusiasm of Dr. Hickson, and the very able services of Dr. Rowe, the Editor, and his colleagues. It was proposed to issue the first part in June, followed monthly by another, the whole to be completed in twelve monthly parts.

Mr. Clare Lees, President of the Manchester Chamber of Commerce, proposed the toast of "The Textile Industry," to which Col. F. R. McConnel, President of the Textile Institute, responded.

Dr. M. O. Forster proposed the toast of "The President."

Smuggling of German Dyestuffs

ACCORDING to reports in the French Press the police authorities at Frankfort have discovered a large organisation for exporting dye-stuffs from Germany by means of false declarations. Some arrests have already been made, and may be followed by others of a sensational character, important personages appearing to be involved in the affair. A net drawn around Frankfort, Fachenheim, Mayence, and other towns, was tightened at the same moment, enabling the police to discover the manner in which the organisation was carried on. Merchants and smugglers bought huge quantities of chemical products, and more especially dye-stuffs in the industrial centres of Germany, and concentrated them at Mayence, where they were placed in crates, carefully camouflaged, and sent across the frontier in small quantities. The police are reported to have seized goods, camouflaged in this way, to a value of more than ten million marks. The "Central Office for Fraudulent Exportation" was found to be at Hamburg, and was provided with a most efficient administrative service.

Clayton Aniline Co's Claim for Damages

Judgment for £22,368 with costs

IN the King's Bench Division, before Mr. Justice Sankey, on April 3, the Clayton Aniline Company, chemical manufacturers, of Manchester, succeeded on a petition of right against the Crown, claiming damages for breach of contract by the Crown respecting the manufacture by the company of TNT, for war purposes.

Sir John Simon, K.C., for the suppliants, said a good deal of the dispute had disappeared by admission and payment. The company first entered into a contract for the supply of 800 tons of TNT at 1s. 6d. per lb., and with respect to that there was a claim for £19,548 10s. 9d., which was admitted, and the amount paid into court. In June, 1915, the Ministry of Munitions agreed to take the suppliant's total output of TNT for the period of hostilities. The contract was subject to a month's notice, but not before June 30, 1917. The company were paid 1s. 6d. a lb. up to 70 tons, and they were induced to increase their output by an offer of a higher payment per lb. as the output increased, up to 1s. 9d. per 100 tons a week. For that purpose the company put down new plant.

The suppliants said the Crown broke the contract because the Crown interposed on May 15, 1917, and ordered them at once to reduce their output to 40 tons, at a time when it had reached 74.5 tons. On June 21, 1917, they were ordered to cease production altogether. The Crown said the reduction to 40 tons a week was by agreement. They admitted that they broke the contract ordering the immediate cessation of production in June, and in respect to that paid into the court damages based on a 40-ton production per week for a month. The suppliants claimed to be entitled to a sum based on a production of 74.5 tons, the amount reached when the Crown ordered the production to be reduced to 40 tons.

Witnesses for the suppliants said they considered they were instructed on May 15 to reduce production and that they were powerless to do otherwise.

For the Crown, Mr. Robert Alexander Alston said that in May, 1917, he visited the suppliant company, and that when he asked Mr. Peak to reduce the output he did not protest. If the company had not assented, the Crown would have cut off their production with a month's notice.

His Lordship, giving judgment, said that the suppliants' claim had been proved, and they would have judgment for £22,368, in addition to the sums paid into court, with costs.

Administration of Alsatian Potash Mines

It is reported from Paris that the Chamber has recently been discussing the future regime to be applied to the Alsatian potash mines sequestered by France. The Commission formed to deal with the question had recommended that the mines be exploited by three companies to which concessions should be given. This recommendation was upheld by the Government, on the ground that competition between the three different companies would increase production and keep prices down. The Chamber voted against a counter-proposal by which the mines would remain entirely State-controlled, but adopted by 289 to 250 votes a second counter-proposal by which the concession would be given to a single company, in which the workers themselves would have shares, in conformity with the law of April 26, 1917. The Commission will study this proposal and another report will be presented.

Revision of Railway Goods Terms

THE Ministry of Transport announces that notice is given by the Railway Rates Tribunal, 2, Clement's Inn, Strand, London, W.C.2, that the railway companies have, in accordance with Sec. 42 of the Railways Act, 1921, submitted to the Tribunal proposed standard terms and conditions of carriage by merchandise and passenger trains. The proposals show the company's risk and owner's risk conditions for merchandise &c., and also deal with damageable goods, not properly protected by packing, coal, coke, breeze, and patent fuel. Copies of the proposals can be obtained from the Secretary, Railway Clearing House, Seymour-street, Euston Square, London, N.W.1, price 1s. post free. Objections to the proposals must be lodged on or before May 16, with the Secretary of the Tribunal, from whom can be obtained a copy of the notice indicating by what persons, and in what manner, objections may be lodged.

Action of Ammonia and Estimation of Hydrogen

Results of Some Recent Investigations

At a meeting of the Birmingham and Midland Section of the Society of Chemical Industry, held at Birmingham University on March 30, Dr. H. W. Brownson presiding, papers were read by Professor A. H. Ling and Mr. D. Rattonji Nanji on (a) "The Action of Ammonia and of Amino Compounds on Reducing Sugars"; (b) "The Action of Ammonia on Dextrose and Lævulose"; and by Professor Ling and Mr. W. J. Price on "A Micro-Kjeldahl Method of Estimating Hydrogen."

The Action of Ammonia

In the first-mentioned paper Mr. Nanji said this investigation was originally undertaken to throw some light on the mechanism of the reactions which occur in the manufacture of so-called caramel by the ammonia process. When ammonia was brought in contact with dextrose (fused or in aqueous solution) either in the form of gas or aqueous solution, at a temperature of, say, 35° - 40° , combination of the ammonia with the sugar took place. If the liquid were heated to a temperature of 100° a vigorous exothermic reaction ensued and dark-coloured substances were produced. Similar reactions occurred when certain amino-compounds were substituted for ammonia. The present experiments referred to the first stage of the reaction between dextrose and lævulose respectively and ammonia, and the nature of the resulting compounds. When an excess of ammonia acted on dextrose at a temperature of about 35° , an additive compound was formed, being the analogue of aldehyde-ammonia, namely, glucose-ammonia. The solution was tested for amino-compounds with negative results. The presence of the aldehyde hydrate decided the course of the reaction between dextrose and ammonia in aqueous solution. It might be assumed that the ammonia combined with the aldehydrol to form an additive compound with the elimination of 1 molecule of water.

When, to a solution of dextrose containing 20 grams of that sugar in 100 c.c. concentrated ammonia was added in quantity amounting to just above 1 molecular proportion, in relation to the dextrose, and the solution was heated at a temperature ranging from 35° - 60° , it was found that the specific rotatory power was that of the usual mixture of glucose in equilibrium. When the heating was continued the rotation still fell the more rapidly as the temperature approached the higher limit. As the reaction proceeded the aldehyde hydrate was removed from the solution as glucose ammonia, and the equilibrium thus disturbed was restored by the conversion of more of the glucose into the aldehyde hydrate. In the presence of an excess of ammonia the reaction proceeded to the point of complete conversion of the dextrose into glucose-ammonia. The experiments showed, however, that this reaction was a reversible one, and that the glucose-ammonia in solution dissociated a certain equilibrium being probably established at any one temperature between the glucose-ammonia and the sugar present; the sugar obtained from the glucose-ammonia was not the aldehydic form. Glucose-ammonia reacted as an aldehyde towards alkaline solutions of some of the heavy metals.

Absence of Mannose

A more thorough examination of the sugar obtained by the action of ammonia on dextrose showed that besides aldose it also contained a ketose. It was found that ammonia reacted with lævulose solutions much more vigorously than with dextrose solutions at temperatures above those of the ordinary room. The reaction in the case of lævulose was accompanied by instantaneous darkening and decomposition. The product obtained from lævulose decolourised permanganate just as that from dextrose. It was evident that by the action of ammonia on either dextrose or lævulose a mixture in equilibrium of aldoses and ketoses was obtained. The author's experiments showed that by the action of ammonia on dextrose or lævulose respectively, no mannose was formed, whereas Lobry de Bruyn and Van Ekenstein invariably obtained a small quantity of that sugar.

The authors summarised the position thus: (1) Dextrose unites with ammonia at a temperature of 35° to form an additive compound glucose-ammonia. This compound reduces alkaline copper and silver solutions with the formation of a metallic mirror. It exists in solution in a state of

dissociation for the specific rotatory power is the same as that of the sugar freed from ammonia. (2) An aqueous solution of the sugar obtained from glucose-ammonia in the form of a syrup reduces potassium permanganate at the ordinary temperature. (3) The sugar consists of a mixture of aldose and ketose in equilibrium, the equilibrium being changed according to reaction of the solutions. In a solution in $N/4$ H Cl, 100 per cent. of aldose is present. (4) Lævulose when treated with ammonia is partially converted into aldose and this unites with ammonia. Possibly when the rotatory power has fallen to its lowest limit complete conversion into aldose has taken place. The solution behaves in every way similarly to the product from dextrose. (5) When the ammonia is removed from this product a mixture of aldoses and ketoses in equilibrium is obtained.

Estimation of Hydrogen

In their paper, Professor Ling and Mr. Price pointed out that among the nitrogenous substances which the bio-chemist had to handle the great majority were amino-or-imino compounds, the nitrogen content of which could be estimated accurately by the Kjeldahl method. Their object was, therefore, to determine if a modification of this method could be devised requiring quantities of substance for each estimation containing nitrogen from 1.0 to 0.1 milligram. They required a micro-Kjeldahl method for the estimation of nitrogen in substances containing a trace of protein and much carbon, e.g., starch preparations and other carbohydrates. In order to come within the range in which they worked, it was necessary to take a weight of carbohydrate amounting to 0.3 to 0.5 gram. Several experiments were carried out using a mixture of phosphoric acid, sulphuric acid, and copper sulphate. This procedure had, however, ultimately to be abandoned owing to the difficulty encountered by the attack on the glass tubes. They were unable to obtain any glass which would withstand the action of the acid mixture, even when the phosphoric acid was reduced to the lowest limit.

In the next series of experiments the weighed portion of the substance was heated in a boiling-tube of hard glass for about five minutes with about 8 c.c. of concentrated sulphuric acid until it charred. The liquid was then cooled, about 1 gram of potassium persulphate was added and the heating continued until the liquid was colourless. After cooling, 40 per cent. sodium hydroxide solution was added carefully till the liquid was faintly alkaline and 5 c.c. of the Nessler reagent. The liquid was then made up to 250 c.c. and its tint compared with that of a standard solution of ammonium sulphate containing the equivalent of 1 milligram of nitrogen in 250 c.c.

The Kjeldahl solution prepared in this manner was invariably cloudy owing to the presence of electrolytes, and it was therefore impossible to compare its tint with that of the standard solution. In order to obviate this difficulty it was necessary to distil the solution. With regard to the use of persulphate this undoubtedly expedited the reaction, which, by its use, could be reduced to about 30 minutes.

The method finally adopted was as follows: An accurately weighed portion of the substance containing 1 to 0.1 milligram of nitrogen was introduced into a hard glass boiling-tube, together with 1 gram of dry potassium sulphate and 0.02 gram of anhydrous copper sulphate; 8 c.c. of concentrated sulphuric acid was then added and 2 drops of 2.5 per cent. platinum tetrachloride solution. A small funnel was placed in the mouth of the tube, and the contents boiled gently until the liquid was colourless. In the case of carbo-hydrates this occupied about one hour. The liquid was then allowed to cool, about 15 c.c. of distilled water added and the diluted liquid boiled to expel any sulphur dioxide. Attempts to deal with the liquid direct were unsuccessful and the authors found it necessary to distil. When cold, the liquid was introduced into a 300 c.c. distilling flask fitted with a tap funnel and connected with a Liebig's condenser by the side tube. The further end of the condenser was fitted with an adaptor, the end of which dipped into about 50 c.c. of water, contained in a graduated 250 c.c. flask. A few pieces of freshly ignited porous porcelain, free from nitrogen, were added to the flask to prevent bumping, together with a small strip of litmus paper. Forty per cent. sodium hydroxide

was added through the tap funnel until the contents of the flask were alkaline. Distillation was now commenced and continued until all the ammonia had passed over. It was necessary to distil about 100 c.c. To the distillate 1.5 c.c. of 40 per cent. sodium hydroxide was added, and then 5 c.c. of the Nessler reagent, the contents of the flask being well shaken after the addition of the sodium hydroxide and of the Nessler reagent. The liquid was then made up to 250 c.c. A stock solution of ammonium sulphate was prepared containing 4.716 grams of that salt and 200 c.c. of $\frac{N}{1}$ sulphuric acid (to inhibit the growth of micro-organisms) in 1 litre. This solution contained 1 milligram of nitrogen per c.c. One c.c. of this solution was added to about 150 c.c. of water in a 250 c.c. graduated flask; to this was added 1.5 c.c. of 40 per cent. hydroxide solution and 5 c.c. of the Nessler reagent, the liquid being well shaken and made up to 250 c.c. After allowing five minutes for the colour to develop 10 c.c. portions of each of the two solutions—the Kjeldahl and the standard—were introduced into two small flat-bottomed tubes of colourless glass. In order that the method would yield accurate results the relation between the degree of colouration by the Nessler reagent and the concentration of nitrogen as ammonia in a given solution must be established. The Nessler reagent was prepared on the Folin and Denis plan.

Constituents of Essential Oils

The Occurrence of Aliphatic Alcohols

MR. L. GUY RADCLIFFE, M. Sc. Tech., F.I.C., delivered the last of his series of three Cantor Lectures on "The Constituents of Essential Oils" on Monday. In dealing with the constituents of essential oils other than those of the turpentine series, Mr. Radcliffe said that the aliphatic alcohols should first be considered, there being a very large number of them in essential oils. Ordinary methyl alcohol occurred in the free state, associated with diacetyl and furfural, and in the myristic ester found in oil of orris, the benzoic methyl ester in oil of ylang ylang, the salicylic ester in the oils of wintergreen and sweet birch, and the methyl ester of anthranilic acid, in which case it was a very important constituent of neroli and jasmine oils. Ethyl alcohol was found in many kinds of esters and in the aqueous distillates from a few essential oils, particularly if the vegetable material had begun to ferment. Normal butyl alcohol occurred as an ester in chamomile oil, iso-butyl alcohol occurred in eucalyptus amygdalina, iso-amyl alcohol in chamomile and other oils, normal hexyl alcohol in the oil of male fern and as a butyric ester in the oils of the heracleum species, and heptyl alcohol in oil of cloves. There were also octyl alcohol, ethyl normal amyl carbinol, and nonyl alcohol, which occurred in the oil of sweet orange and had a roselike odour.

Aromatic Alcohols

The chief of the aromatic alcohols was benzyl alcohol, which occurred in the free state and in the form of esters in many essential oils and was used as a local anaesthetic for minor surgical operations. Another important alcohol was phenyl ethyl alcohol, which had a roselike odour. Cinnamic alcohol was a very interesting one but was very difficult to manufacture, and there was also phenyl propyl alcohol, which was a fairly thick oil with a similar odour to that of cinnamic alcohol.

Methyl anthranilate, which was the methyl ester of ortho amido benzoic acid, was found in neroli oil and in many other flower oils, and it had a very powerful odour. The methyl ester of methyl anthranilic acid had been found to the extent of 1.5 per cent. in the oil of mandarins and in the oils of rue and orange blossom, being an oily liquid with a very pleasant odour. Methyl benzoate was a very well known ester with a heavy eastern kind of odour, and it was characterised by the fact that it formed a crystalline compound with phosphoric acid. The methyl ester of cinnamic acid had a certain amount of interest; it was found in a number of essential oils and was strongly odorous, the commercial article being fairly largely used for the perfuming of toilet articles, on account of the persistence of the odour. Methyl phenyl acetate had a very strong honeylike odour, it was not on the market to-day to any great extent, but it was of considerable value. Methyl salicylate was very well known but much difficulty was experienced in distinguishing between natural oil of wintergreen and the artificial methyl salicylate.

Iso-amyl Alcohol Esters

In connexion with the esters of iso-amyl alcohol an investigation had recently been made into the actual composition of the odorous constituents of apples, which had led two American chemists, Mr. F. B. Power and Mr. V. K. Chestnut, to publish a formula for a mixture which would reproduce the true odour of apples in beverages and foods. That mixture consisted of 10 parts of the iso-amyl ester of formic acid, 10 parts of the iso-amyl ester of acetic acid, 5 parts of the iso-amyl ester of normal caproic acid, 1 part of the iso-amyl ester of normal caprylic acid, and 2 parts of acetaldehyde.

Benzyl acetate was found in the oils of jasmine, ylang ylang and other flower oils, and it had a very strong odour. Its quality, apart from its odour, was judged by the absence or otherwise of chlorine, a much better price being obtained for benzyl acetate that was free from chlorine. Benzyl benzoate was a constituent of many essential oils, such as the balsams, and was used as a solvent for artificial musk and as a diluent and fixing agent for the more volatile essential oils. It had to be made with great care but was not difficult to make. Benzyl cinnamate had a very sweet odour and was used to a certain extent for perfuming tobacco, a subject to which, he thought, the perfume industry would do well to pay more attention.

Polymerisation of Aldehydes

Turning to the aldehydes and dealing first with the fatty ones, the lecturer said that duodecyl aldehyde occurred in pine needle oil and when mixed with ionone produced a very natural violet perfume. Certain of the aldehydes, such as nonyl aldehyde and duodecyl aldehyde, were difficult to make and difficult to preserve, owing to their tendency to polymerise, which could only be prevented by their being kept in alcohol solutions in the dark. Such aldehydes as benzaldehyde were of importance for flavouring purposes, and there was no difficulty at the present time in making benzaldehyde on a large scale entirely free from chlorine. It was a raw material for the preparation of cinnamic aldehyde. Two other aldehydes of considerable interest were salicylic aldehyde, which could be used as a raw material for the manufacture of cumin and anisic aldehyde, which had a very powerful hawthornlike odour. The artificial manufacture of vanillin, which was the methyl ester of protocatechuic aldehyde, was originally a gold mine to those who had developed it, and a very large number of patents were taken out for it. Eugenol was still the best raw material for the preparation of vanillin, the difficulty being to make the vanillin economically, so that it could be sold at a low price. Before the war, vanillin, heliotropin and thymol were sold in Germany at cut-throat prices, owing to competition, but better prices could now be obtained for them. Heliotropin occurred to a small extent in vanilla and in oil of spiraea, and it could be made from the alkaloid piperine which occurred in pepper. It was made on a very large scale from safrol, which was obtained from camphor oil.

Of the many phenolic compounds which occurred in essential oils those containing the allyl or the propenyl groups were of special interest. The cresols occurred in a great many oils, and many of them were used for synthetic products. Guaiacol was found to a certain extent in celery oil, and had a very characteristic odour; it was quite easy to manufacture it artificially. Thymol was a very valuable substance which was manufactured on a large scale in this country, and the derivatives of thymol were also interesting. Eugenol was of great importance; it was a constituent of oil of cloves and the oils of allspice, bay and cinnamon leaves. The conversion of eugenol into iso-eugenol was an essential stage in the production of vanillin, and safrol also underwent a similar transformation into iso-safrol, which was a stage in the manufacture of heliotropin. There were certain other substances that might be mentioned, such as coumarin, which was manufactured in this country and was used in the perfuming of tobacco; pyridine, which was obtained from the oil of coffee beans when roasted; and indol and skatol, which had a great attraction for winged insects, beta methyl indol being used in the making of certain kinds of fly papers.

In conclusion, Mr. Radcliffe said that much progress had been made in research in every direction and there had been a distinct advance in the knowledge of the constituents of essential oils. Much work had been carried out in connexion with the preparation of purely synthetic odorous substances, such as phenyl acetaldehyde and the ionones. More and more use had been made of optical methods, and the data obtained from those methods had made the path of the adulterator exceedingly difficult. The manufacture of flavouring esters

in this country had been developed to a considerable extent, but there was much yet to be done in the way of securing absolute uniformity of the products. The uniformity of the products offered was of very great importance to the user, who had to produce comestibles that were always of the same odour and taste. The British Empire contained such varieties of climate and soil that it was possible for it to provide all kinds of raw materials and essential oils. The Dominions and Colonies should be urged and assisted to develop their resources as fully as possible.

The industry should combine to form a Research Association governed by thoroughly competent members of firms already engaged in the industry, and that Association should have power to approach the Government authoritatively on all matters with which the industry had to deal.

The Structure of Fuels

An important paper was read by Messrs. E. R. Sutcliffe and Edgar C. Evans on "The Structure of Fuels" before the Society of Chemical Industry on Monday evening. Mr. Sutcliffe is the head of the well-known engineering firm of Sutcliffe, Speakman & Co., Leigh, Lancashire; Mr. Evans was formerly head of the Rhondda Research Laboratories, and was chief scientific advisor to the late Lord Rhondda. The paper summarised the results of ten years' continuous research work on the part of the authors, and opened up extremely important possibilities in connexion with the future of British Industry.

As the result of their work the authors had come to the conclusion that the free burning property of a fuel is due not so much to its composition as to its structure. They went in detail into the scientific aspects of this conclusion and then devoted some time to discussing the possibilities in connexion with British Industry. They pointed out that the work performed would allow of the production of smokeless fuel of first-class quality for domestic consumption in any existing gasworks or coke-oven plant in the country. Such a fuel would be extremely dense and hard, and would completely solve the smoke problem in the great cities of this country.

So far as industrial use was concerned it offered very considerable possibilities in simplifying boiler plant, and in considerably increasing the output from existing installations. A further extremely important application was in the saving of fuel consumption in the blast furnaces of this and other countries.

The authors pointed out that no improvement had taken place in this respect in connexion with British blast furnace practice for practically fifty years. With coke of the type used at present, very little improvement was possible, even in the most modern plants working on British ores, and the late Sir Lothian Bell had definitely stated that a minimum consumption of over 20 cwt. of coke a ton of pig-iron was absolutely necessary with Cleveland ores. The authors, however, hoped that with a coke of a different type this figure might be considerably reduced, and they anticipated that it would be possible to produce one ton of pig-iron with an expenditure of only 12 cwt. of coke, a saving which would have enormous possibilities to the British iron and steel industry. This could be done by the use of a new fuel of the type discussed, and they considered that revolutionary possibilities of fuel economy were feasible which would go a long way to bringing the British iron and steel industry back to its former importance.

The paper was illustrated with photographs and lantern slides which had been specially prepared by Sir George Beilby, director of the Fuel Research Board.

Foreign Competition in the Salt Trade

SPEAKING on March 29 at the annual meeting of the Salt Union, Ltd., Mr. G. H. Cox (the chairman), said that the remarkable prosperity which the company enjoyed in 1920 suffered a great reduction during 1921, and, coupled with an almost complete cessation of demand for fishery salt, caused the total tonnage to fall to only three-fifths of that of 1920. Former customers abroad had supplied their wants by cheap purchases of German and solar salt. The spread of the non-co-operative movement in India had made the marketing of the company's salt more difficult than it would otherwise have been. As to their home trade, they had been exposed to fierce competition.

The Disclosure of Secret Formulae

THE public examination of Mr. Irving Alexander Keene (described in the receiving order as the Keene Company), manufacturing chemists, 52 Gray's Inn Road, London, was resumed at the London Bankruptcy Court on March 31, his statement of affairs showing liabilities £11,168, of which £10,818 are expected to rank for dividend, and established net assets £2,046 (see THE CHEMICAL AGE, Vol. V., p. 572, and Vol. VI., p. 150). On examination the debtor declined to give any particulars relating to the recipes of certain secret formulae. He explained that he and his brother had jointly invented the formulae in question, and they had never been reduced to any tangible form. It would not have served any very useful purpose had they been so reduced, because although it was true that none of the formulae were very difficult or intricate, the capacity to make the preparations rested in his brother and himself. The debtor admitted that Parke Davis & Co. had been manufacturing the cold cure. The original formula for that was, however, suggested by that firm, and he and his brother having made a few slight changes in it, Parke Davis & Co. began to manufacture for them. The debtor, however, did not attach too much importance to the cold cure. It was true that the firm in question were aware of the secret process in that instance, but he contended that it was an understood thing that secrets of that kind must be kept in the trade. The Registrar said he possessed no power to make the debtor disclose secret formulae. That was a matter which would have to be decided by the judge, to whom a report of the facts would have first to be made. The Registrar ordered an adjournment of the examination until April 19, it being understood that an application would in due course be made to the judge sitting in Bankruptcy.

Brazilian Centenary Exhibition

AN excellent opportunity for British chemical manufacturers and merchants to extend and open up new business in South America is offered by the Brazilian Centenary Exhibition to be held at Rio de Janeiro from September 7 to December 31 next in celebration of the centenary of Brazilian independence. The British section is being organised by the Department of Overseas Trade. Realising that many British firms who could do good business there cannot at present afford the sum necessary to exhibit the actual goods on the scale required, the Department has made arrangements for the display of such goods by means of models, cinema films, lantern slides, and lumière plates. The cost of exhibiting at the exhibition on these lines need amount to no more than £30 for the three months of its duration. No additional expenses need be incurred for salesmen, the Department having arranged for the presence of representatives to deal with orders and inquiries for exhibitors who desire such help. Full particulars can be obtained on application to the Department of Overseas Trade, at 35, Old Queen Street, Westminster, London.

Ozone in Timber-Seasoning

ACCORDING to the *Journée Industrielle*, M. Otto, Professor at the Sorbonne, has invented a process for seasoning timber by the use of ozone. The process is said to give the same result in about twenty days as would naturally be obtained in the course of several years. The wood is subjected to the action of a current of air containing a certain percentage of ozone. A micrographic examination made by the laboratory of the Conservatoire des Arts et Métiers is reported to show that samples of oak and walnut which had been treated by the Otto process show the same characteristics as seasoned wood. The treatment does not change the colour of the wood. The Otto process is being worked by a French company which has constructed works at Seregno near Milan, and will shortly build new works in the neighbourhood of Paris.

Iron and Steel Institute

THE annual meeting of the Iron and Steel Institute will be held at the Institution of Civil Engineers on May 4 and 5, when Mr. Francis Sutherland will deliver his presidential address and the Bessemer medal will be awarded to Professor Kotaro Honda. A dozen papers are on the programme for reading and discussion. The annual dinner is fixed for May 4.

Chemical Matters in Parliament

Developing British Chemical Industry

Replying to Major M. Wood (House of Commons, April 3), Mr. Baldwin said it had been repeatedly pointed out, both during the passage of the Safeguarding of Industries Act and in reply to questions since, that the object of Part I. of the Act was to encourage the development of the industries to which it relates, and the extension of their range of production to varieties of goods not previously produced in this country. He was satisfied that that extension was taking place, particularly in respect of the products of the chemical industry comprised within that heading of the Schedule.

Deletions from Safeguarding List

Sir William Barton (House of Commons, April 3) asked the President of the Board of Trade whether he was in a position to state what other commodities of an analogous character would be deleted from the list of dutiable articles under the Safeguarding of Industries Act following the decision of the Referee in respect of cream of tartar, tartaric and citric acids, which were held to have been improperly inserted in the list.

Mr. Baldwin said a list would be issued in the course of the present week.

Defining a Fine Chemical

Dr. Murray (House of Commons, April 3) asked the President of the Board of Trade whether he was aware that after exhaustive hearings before the Referee under Part I. of the Safeguarding of Industries Act, it was admitted by his Department, manufacturers, merchants, and scientists, that the term in the schedule, "all other fine chemicals," cannot be interpreted; and, if so, what steps he proposed to take to rectify the matter.

Mr. Baldwin said the doubts which had arisen related to only a limited number of cases which were of a border-line character, and provision for dealing with these was in the Act itself. No further action appeared to be necessary.

Repeal of Safeguarding Act

Questioned by Dr. Murray whether in view of the judgments already signed in respect of santonine, cream of tartar, tartaric acid, citric acid and lactose, he was prepared to repeal the Safeguarding of Industries Act, which satisfied neither manufacturers nor distributors while avowedly increasing prices to the consumer, Mr. Baldwin (House of Commons, April 3) said he was aware of the decisions, but did not accept Dr. Murray's conclusion from them. He was not prepared to take the course suggested.

Duty on Lactose

In reply to Colonel P. Williams (House of Commons, April 3), Mr. Young said the duty paid on imported lactose could not be refunded, as Sec. 1 (5) of the Safeguarding of Industries Act provided that any decision of the Referee should be without prejudice to anything previously done.

Hearing of Complaints

Mr. Kiley (House of Commons, April 3) asked the President of the Board of Trade whether he was in a position to state if any alterations were being adopted by the Committees under the Safeguarding of Industries Act to shorten the proceedings; and whether he was prepared to adopt the suggestion made by Sir Arthur Colefax, K.C., that examination and cross-examination by witnesses should be permitted in preference to allowing statements to be made, upon which witnesses cannot be examined, and the postponement of meetings of the Committee to enable rebutting evidence to be collected, which often entailed a delay of many days and involved heavy expenses.

Mr. Baldwin said he was satisfied that the Committee were fully alive to the importance of completing their inquiries as rapidly as was consistent with a full examination of the questions referred to them, and he doubted very much whether the adoption of the suggestion referred to would operate in the direction of reducing expense or of shortening the proceedings.

Publication of Referee's Decisions

In reply to Mr. Kiley (House of Commons, April 3), Mr. Baldwin said he thought there were objections to giving information with regard to complaints which might or might not have been received by the Board of Trade pending the decision to refer such complaints to a Committee. All

complaints were dealt with as expeditiously as possible. It was proposed to announce without delay the effect of the findings of a Committee who report in a sense adverse to the application. He doubted, however, the desirability of making a similar announcement where the Board of Trade found that no *prima facie* case had been made out. He was the only person who had ultimate authority to decide whether or not a *prima facie* case had been made out for an appeal.

Collection of Duty

Mr. A. Williams (House of Commons, April 3) asked the Prime Minister if he was aware that the sum collected under the Safeguarding of Industries Act for the six months just expired amounted only to £134,000; that to collect this amount it had entailed the detention and examination of enormous quantities of imported goods to the estimated value of many millions of pounds; and that in addition to the inconvenience caused by the delay this had added immensely to the costs known as breaking-in, breaking-out, demurrage, clearance charges, &c., all of which charges had to be incurred not alone on the dutiable goods but on all goods so detained; and whether, in view of the smallness of the amount realised, he was prepared to consider the amending or repealing of the Safeguarding of Industries Act, even if that course involved the granting of a subsidy to any commodity that might be considered essential for the safety of the Empire.

Mr. Baldwin said the amount of duty collected was £141,000, but he would point out that the raising of revenue was not the primary object of the Act. In any case, where liability to duty could not immediately be determined, delivery could always be obtained on deposit of the amount of duty to which the goods might be liable. He pointed out, however, that imported goods were always liable to examination by Customs, and he was advised that the more detailed examination of certain classes of goods made necessary by the Safeguarding of Industries Act had no consequences at all commensurate with those suggested by Mr. Williams. The answer to the last part of the question was in the negative.

Palm Kernels Duty

Relying to Mr. Ormsby-Gore (House of Commons, April 4), Mr. Churchill said his attention had been drawn to the criticism made at a meeting of the Niger Co., Ltd., by Mr. W. H. Lever on British Colonial policy in West Africa and its effect on the British West African oil trade. Palm kernels from British West African Colonies to the Continent were subject to a differential export duty of £2 a ton, which applied to all palm kernels not shipped to and landed in a port of the Empire. The object of imposing this duty was that there should be an inducement to send the kernels to British ports, in order to encourage the supply of the raw material for British manufacturers. He would consider the question of removing the duty on receipt of the views of the Governments of the British West African Colonies on the recommendations of the Committee on Trade and Taxation for British West Africa. The Committee did not recommend the removal of the revenue export duty levied in Nigeria.

White Sugar of Lead

Mr. Kiley (House of Commons, April 4), asked the Chancellor of the Exchequer if he was aware of the complaint made to the secretary of the Board of Customs and Excise by Higginbotham & Co., of Manchester, concerning the detention of eleven cases of white sugar of lead, for which the forms and duty had been duly tendered to the Department on March 16; that delivery of the cases had been withheld on the ground that the invoice from the suppliers in London was not considered by the Department sufficient, and that the Department demand the production of the invoice from the manufacturers in Germany, which invoice Messrs. Higginbotham said they were unable to obtain as the suppliers refused to give away their trade secrets; that this procedure was not in force at either Liverpool or Hull; and, in order to avoid further expense for breaking-in and breaking-out charges, rent, and demurrage, would he give instructions for the goods in question to be released forthwith and also instruct the staff concerned that they were not unreasonably to withhold clearance of goods except in cases in which they had evidence of fraud or attempted fraud?

Sir R. Horne said he was informed that the complaint referred to was only received by the Board of Customs and Excise on March 30, and that inquiry was being made into the matter. He would communicate the result in due course.

From Week to Week

PROFESSOR F. HABER has been nominated president of the German Chemical Society for 1922-23.

A. BOAKE ROBERTS & CO., LTD., Carpenters Road, Stratford, London, announce that their telephone number is now Mary-land 1050 (4 lines).

We regret to record the death on March 27, after a long illness, of MRS. LAPORTE, the wife of Mr. Bernard Laporte, of The Bungalow, Harpenden.

THE WEST RIDING CHEMICAL CO., LTD., announce that they are re-opening their works at Steanard Lane, Mirfield, for the manufacture of further chemicals.

The annual report of the Committee of University College, London, states that capital funds to the extent of £15,000, are needed for the NEW CHEMICAL LABORATORIES.

MR. JOHN MARTIN, for many years secretary of Van den Berghs, Ltd., died on April 2, at 29, Mornington Road, Woodford Green. Mr. Martin was eighty-one years old.

It is reported that the U.S. Senate Committee of Finance has decided to extend the EMBARGO ON IMPORTED DYES for one year after the passage of the pending Tariff Bill.

MR. A. W. FILMER, a director of the Anglo-Continental Guano Works, Ltd., is a director of the Porcupine-Davidson Gold Mines, Ltd., which has just made a public issue of capital.

A new Belgian company, subsidiary to Lever Brothers, Ltd., is reported to have been formed for the refining of VEGETABLE OIL PRODUCTS in the Belgian Congo. The company, which is known as the Savonneries Congolaise, will have its head offices in Brussels.

As from April 1 the business of Burton, Baker & Co., chemical merchants, 16, Eastcheap London, has been converted into a limited liability company under the style of BURTON, BAKER & CO., LTD. The registration involves no change of management.

The strike among the Indian employees of the ANGLO-PERSIAN OIL CO., LTD., is now over, the trouble having been confined to imported labourers, who have now been repatriated. The output of the refinery continued normal during the short period of the strike.

Chemical manufacturers and merchants who desire information or assistance in connexion with EXPORT TRADE WITH JAPAN will have the opportunity of seeing Mr. Hugh Horne, Commercial Secretary to H.M. Embassy at Tokio, at the offices of the Department of Overseas Trade until April 13.

Owing to the scarcity of liquid fuel the Roumanian Ministry of Industry is reported to have organised the manufacture of a special fuel, by compounding various oil products, for use by the State Railways. It is stated that the compound will be used instead of residue oil, and will have a flash-point of over 45°.

In connexion with the Fuel Technology Department of the University of Sheffield, a course of FIVE LECTURES ON "COAL" has been arranged for Thursday afternoons between April 27 and May 25. The lecturers are Dr. Marie Stopes, Mr. F. S. Sinnatt, Dr. R. Lessing, Mr. R. Wynter Blyth, and Professor J. W. Cobb.

At a general meeting of members of the ROYAL INSTITUTION, held on Monday, the secretary reported the death of Professor P. A. Guye, of Geneva, an honorary member of the Institution, and a resolution of condolence with the family was passed. Dr. R. H. Cole, Messrs. A. J. Bryant, J. Lenman, and T. W. Stevenson were elected members.

The South Wales Institute of Engineers, meeting at Cardiff on March 30, discussed a paper read by Mr. R. W. Atkinson on the IRON ORES OF SOUTH WALES. Mr. Atkinson submitted an amended estimate of the unworked iron ores in South Wales, computing the quantity at about fifteen thousand million tons, or nineteen million tons per square mile.

The first part of the new COLOUR INDEX which is being prepared by the Society of Dyers and Colourists under the editorship of Dr. F. M. Rowe, is expected to be published early in June. The Index will contain particulars of about 1,400 individual colours, including quite a large number of dyes which have never figured before in a work of this kind.

The Aerô Club of America has published a communication from California relating to a DEMONSTRATION OF A NEW GAS named "currenium," after Dr. Edward Curren, who has

developed it. The new gas is said to have almost the same lift as hydrogen, and is non-inflammable. It can be produced by an electrolytic process at about £3 per 1,000 cub. ft.

At a meeting of the Council of the Rubber Growers' Association on Monday, the chairman stated that the British Colonial authorities were known to be in favour of LEGISLATIVE ACTION TO SAFEGUARD THE INDUSTRY. He also asserted that there was strong ground for believing that the British Government authorities concerned would welcome a conference in London with the Dutch on the subject.

Preparations are in hand for a MINING AND INDUSTRIAL EXHIBITION to be held in Johannesburg in October next. The exhibition will be under the auspices of the Chemical, Metallurgical, and Mining Society of South Africa, and United Kingdom firms interested may obtain particulars from the Secretary, Chemical, Metallurgical, and Mining Society, 100, Fox Street, Johannesburg, South Africa.

The Waterloo Chemical Works, Sydney, New South Wales, propose to establish works at Hobart for the ELECTROLYTIC MANUFACTURE OF PIGMENTS from scrap iron. It is stated that the company's works will be removed from Sydney to Hobart and advantage taken of the cheap hydro-electric power, 500 H.P. being ultimately required. The initial output will be ten tons weekly, but larger works are contemplated.

The University of Manchester has made the following appointments in the FACULTY OF TECHNOLOGY: Mr. W. H. Brindley, M.C., B.A. (Cantab.), Mr. W. Hubball, M.C., B.Sc.Tech. (Manchester), Mr. W. H. Kelly, B.Sc.Tech. (Manchester), Miss Esther Levin, M.Sc.Tech. (Manchester), and Mr. J. D. Mounfield, B.Sc.Tech. (Manchester), demonstrators in Technological Chemistry; Mr. G. Mohn, M.Sc.Tech. (Manchester), demonstrator in Metallurgy.

The death is reported from New York of Mr. JOHN BALLOT, president of the Minerals Separation Co., the American branch of Minerals Separation, Ltd., of 62, London Wall, London. Mr. Ballot, who was born in South Africa, was an authority on the mineral formations of the Rand. Well known in London, he had lived in New York for some years, where he was much engaged in litigation as to the rights of his company's process for the recovery of metal residues by oil flotation.

At the ANNUAL MEETING of the Birmingham Section of the Society of Chemical Industry held at Birmingham University on March 30, Dr. E. B. Maxted was elected chairman of the Section. Professor G. T. Morgan and Mr. F. R. O'Shaughnessy (for seventeen years hon. secretary of the Section, and who is retiring in July from that office) were elected vice-chairmen, and Mr. G. King was appointed hon. secretary and treasurer. The following were elected to the committee: Dr. Brownsdon, Dr. Parker, Mr. W. Clifford, and Mr. C. Watson; the other members of the committee being Professor A. R. Ling, Messrs. H. J. Alcock, G. H. Blenkarn, N. P. Booth, F. L. W. Bradford, S. A. Brazier, S. R. Carter, W. C. Davis, J. C. Mann, H. T. Pinnock and H. Silvester.

DR. ANDREW MCWILLIAM, consulting metallurgist, and formerly Professor of Metallurgy in Sheffield University, died at Sheffield on Wednesday. In 1911 he was appointed head metallurgical adviser to the Government of India, and on his return in 1920 he received the C.B.E. in recognition of his work in connexion with steel-making in India. He had a successful career at Sheffield University, and before his departure for India he was given the degree of Doctor of Metallurgy for his researches into the metallurgy of steel. A native of Scotland, he was educated at Glasgow and the Royal School of Mines, London. At one time he was chemist to the Martino Steel Company, and for two years lecturer in metallurgy to the Staffordshire County Council.

With regard to the new process of APPLYING RUBBER-LATEX TO PAPER-MAKING, it is reported that the Rubber Growers' Association has arranged for all the necessary supplies of latex needed for the experiments, and has also set up the sub-committee which will go into questions of shipping costs, freight, containers, &c., while the Research Department of the R.G.A. is studying the various means of preserving the latex. Professor Kaye is credited with the calculation that quite 40,000 tons of latex would be annually needed in this country if his experimental attempts become a commercial proposition. The latest news is that experiments are now going forward for the use of latex in the manufacture of paint, on account of the elasticity it insures.

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ALUMINATES. Sodium aluminates; equilibria in the system $\text{Na}_2\text{O}-\text{Al}_2\text{O}_5-\text{H}_2\text{O}$. F. Goudriaan. *Rec. Trav. Chim. des Pays-Bas*, February 15, 1922, pp. 82-95.

ANALYSIS. A new method for the estimation of sulphur in organic compounds and in some technical products—petrol, oil, illuminating gas and rubber. H. ter Meulen. *Rec. Trav. Chim. des Pays-Bas*, February 15, 1922, pp. 112-120.

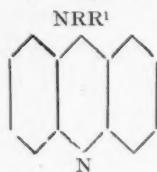
Estimation of sulphur in iron, steel and pig. H. ter Meulen. *Rec. Trav. Chim. des Pays-Bas*, February 15, 1922, pp. 121-123.

The determination of aromatic hydrocarbons in mineral oil fractions. H. I. Waterman and J. N. J. Perquin. *Rec. Trav. Chim. des Pays-Bas*, March 15, 1922, pp. 192-198.

Patent Literature

Abstracts of Complete Specifications

176,038. ACRIDINE DERIVATIVES, MANUFACTURE OF THERAPEUTICALLY ACTIVE. O. Imray, London. From Farbwerke vorm. Meister, Lucius, & Brüning, Hoechst-on-Main, Germany. Application date, October 14, 1920. New compounds having the general formula:



are obtained by introducing into the 9-position of acridine or a derivative or a substitution product, the amino group or a residue of a primary or secondary amine which is not an arylamine. R and R' represent hydrogen or residues which are not aryl groups. The acridine residue may contain atoms or atomic groups as substituents, e.g., halogen, NH_2 , NO_2 , an alkyl or an alkoxy-group. The products are obtained by the action of ammonia or a primary or secondary amine which is not an arylamine on a 9-halogen acridine or a 9-RO-acridine. Numerous examples of the preparation of these products are given.

176,099 176,100-1-2. DISTILLING OILS, APPARATUS FOR. T. E. Robertson, London. From Power Specialty Co., 111, Broadway, New York. Application date, November 26, 1920.

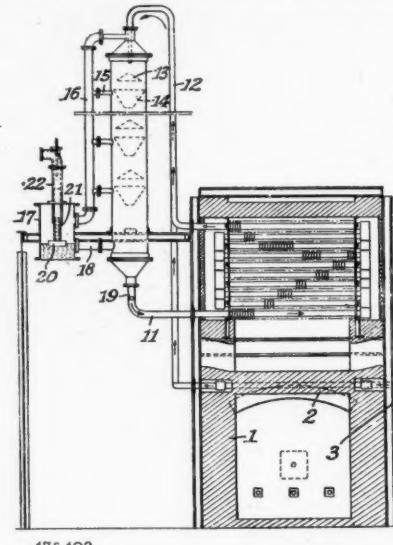
176,099. The apparatus is for effecting the "topping" process for refining oils, and the object is to obtain a uniform and efficient heating of the oil. The apparatus comprises two chambers divided by a vertical wall which allows them to communicate at the top. The bottom of one chamber communicates with a furnace or source of heat and the bottom of the other with a stack. The first chamber contains a series of horizontal tubes in its upper part which are connected with another series of horizontal tubes in the second chamber. The latter set of tubes are of comparatively small diameter and are preferably connected in vertical series in multiple. The upper header is connected to the lower header of the tubes in the adjoining chamber. The oil is circulated first through the cooler chamber and then through the hotter chamber in counter-current to the hot gases. Each bank of tubes is supported by a transverse wall in the compartment.

176,100. In this case, a set of oil heating pipes is encased in the furnace roof, and connected in series with another set of pipes arranged in the path of the hot gases. The furnace roof may form a horizontal partition which divides the heating chamber into two portions, and the banks of tubes in the upper portion may be arranged in two or more sets which are connected in series. Separators may be arranged between adjacent heating units, and are provided with vapour outlets.

176,101. In the type of still described above, it is found that the oil, after its passage through the second bank of pipes, does not give off all its volatile constituents, but a proportion of these goes into the separator with the oil. The separator is provided with a return pipe communicating with the inlet of the second bank of pipes, so that the unvolatilised oil may be returned to the heating pipes. A larger output of light vapour is thus obtained.

176,102. In this case, the pressure between adjacent banks of heating pipes is controlled by a special float valve device. The roof 2 of the furnace 1 is constructed of heat-resisting material and contains a single zig-zag line of piping through which the oil enters. The oil then passes through banks of tubes above the roof 2, which are arranged in the path of the hot gases. A separator is connected between adjacent sets of tubes, and vapour is drawn off from each separator. The hot oil is delivered on to a spreader 13, and then to a receiver 14, and so on. Gas outlets 15 are connected beneath each receiver, and communicate with a common pipe 16. The vapour is thus led into the top of a pressure-control chamber 17, the lower part of which is connected to the lower part of the separator. A pipe 19 connects the bottom of the latter with the bottom of the next bank of

tubes. Any obstruction of the flow of oil causes the level in the chamber 17 to rise and lift the float 20 to close the gas



external thick-walled tube 4 is flanged at both ends and closed by thick plates 13A. The catalyst is contained between thin concentric iron tubes, 5, 6, and is heated electrically by a resistance 7 within the tube 5. The tube 6 is surrounded by heat insulation 8. The gases are admitted through passages 17, 9, 10, 2 and withdrawn through passages 3, 16, 15, 1. The inflowing gas is preheated by passing inwards around the tube 1 through which the hot gases flow outwards. The heating resistance 7 is carried by a steel stopper 12 through which the connecting wires 11 pass.

176,235. CONDENSATION OF *o*-BENZOYLBENZOIC ACID. F. W. Attack, of British Alizarine Co., Ltd., Trafford Park, Manchester. Application date, February 9, 1921.

Instead of using concentrated sulphuric acid for the condensation of *o*-benzoylbenzoic acid to yield anthraquinone, acid of 80 per cent. strength or less, is employed. Anthraquinone is insoluble in dilute acid so that it may be removed from the reaction zone by filtration. The acid liquor may then be used again until it becomes too dilute, when it may be concentrated to 80 per cent. by evaporation or by adding sulphur trioxide or oleum. The process may be made continuous by adding the *o*-benzoylbenzoic acid in molten form and blowing air through the hot acid to evaporate the water.

176,284. ACETONE AND BUTYL ALCOHOL, MANUFACTURE OF, BY FERMENTATION. Soc. Ricard, Allenet & Cie., Deux-Sèvres, France. International Convention date, February 28, 1921.

In a known process for making acetone and butyl alcohol, the raw material is boiled under pressure, diluted, sterilised, and aseptically chilled. The wort obtained is seeded with a flask culture or with a small proportion of fermenting wort. In the present invention a large volume of the ferment is used, and a small proportion of non-aseptic wort, which is to be fermented, is added to it. Fermentation of the latter then takes place very rapidly, and some of the fermented liquor may then be removed and a further quantity of unfermented wort added. The non-aseptic wort may be made by boiling amylaceous material to a high concentration and diluting it with cold non-sterilised water.

International Specifications not yet Accepted

174,611. FATTY ACIDS. F. Zerner, 1, Neudeggergasse, Vienna. International Convention date, January 29, 1921.

Petroleum or rock oil distillation products are freed from all unsaturated impurities by treatment with liquid sulphur dioxide. A gas containing oxygen is then blown through the residue in the presence of lime or other base, and fatty acids are produced.

174,635. CHLORINATING ACETYLENE. Holzverkohlungs-Industrie Akt.-Ges., Konstanz, Baden, Germany. International Convention date, January 29, 1921.

A mixture of acetylene, chlorine, and superheated steam in the proportions 1:2:12 is passed at the rate of 15 litres per hour through a pipe containing refractory clay heated to 500°C. A catalyst such as copper, iron, or calcium chloride may also be present. The nature of the products depends on the proportions, temperature, and velocity of the gases, but in the above instance, dichlorethylene, trichlorethylene, tetrachlorethane, and higher products are obtained in the proportions 1:6:6:1.

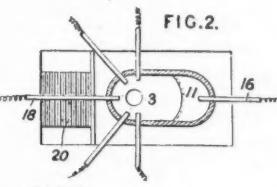
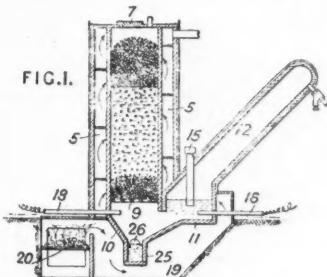
174,642-3. FATTY ACIDS. H. Winternitz, 22, Johann Straussgasse, T. Bullinger, 202, Währingerstrasse, and G. Teichner, 3, Anton Frankgasse, all in Vienna. International Convention date, January 29, 1921.

174,642. Liquid hydrocarbons are purified from constituents which tend to form resinous substances by treating with fuming sulphuric acid, and may then be oxidised by air or oxygen in the presence of a base to form fatty acids. As a substitute for the preliminary purification, the hydrocarbons may be mixed with the product obtained by blowing air through the raw material in an acid medium. The base is then added, and the oxidation proceeded with.

174,643. Addition to 174,642. In the above process the base employed is dry slaked lime, an alkaline earth, or magnesia, and the oxidation is effected in steps, the impurities being filtered off between the steps.

174,908. ALUMINIUM AND TUNGSTEN OXIDES; ALKALI ALUMINATES AND TUNGSTATES. J. D. Gat, North Canton, Ohio, U.S.A. International Convention date, February 2, 1921.

Natural silicates are treated with a molten bath containing free alkali metal obtained by electrolysing sodium chloride or the like. Compounds of metal oxides with sodium aluminate, sodium tungstate, etc., are obtained. A receptacle 11 having a well 25 is heated by hot gases from a furnace 20, the gases afterwards passing around a flue 5 surrounding a vertical shaft. Molten sodium chloride is fed into the apparatus through an inlet 15 and is electrolysed between anodes 16, 18. Chlorine collects in the chamber 12 and forces the molten salt upwards in the shaft to a point about one-third from the top. The natural substance, such as clay, kaolin, orthoclase, spodumene, bauxite, etc., is fed in at the top and sinks on to the grating 9, where it is subjected to the action of free sodium. Ferric oxide and like substances are reduced, and the sodium oxide formed combines with the alumina and silica. The product is dissolved in water and treated with carbon dioxide. The precipitate of silica and alumina is treated with caustic soda or hydrochloric acid to dissolve out the alumina, which may afterwards be precipitated from the alkali by carbon dioxide, or from the chloride by evaporating and calcining.



174,913. SACCHARINE. H. Lowe, 11, Marburgerstrasse, Berlin. International Convention date, January 31, 1921.

Orthotoluene-sulphamide is suspended in a weak solution of sodium carbonate, and electrolysed with a current of 0.04 amps per sq. cm. of anode, at 12 volts. Ammonia, or compounds of lead, cerium, or manganese may be added to facilitate the reaction. The electrolyte is then acidified and the saccharine filtered off. A yield of over 75 per cent. is obtained.

174,915. VULCANISING INDIARUBBER. Naugatuck Chemical Co., Elm Street, Naugatuck, Conn., U.S.A. (Assignees of S. M. Cadwell, 200, Ames Avenue, Leonia, N.J., U.S.A.). International Convention date, February 1, 1921.

A mixture of rubber, a vulcanising agent such as sulphur, and a substance adapted to permeate it, is vulcanised either in the cold, or by heat. In an example, a mixture is formed from rubber, 100 parts; zinc oxide, 10 parts; oxybutyl-thiocarbonic acid disulphide, 6 parts, and sulphur, 3 parts; and another mixture from rubber, 100 parts; zinc oxide, 10 parts; sulphur, 3 parts; and aniline, 4 parts. These two mixtures are blended and then moulded. A temperature of 70°F. completes the vulcanisation in a week, and a higher temperature in a shorter time. Alternatively, the first mixture may be moulded and painted with oxybutyl-thiocarbonic acid disulphide. The latter may be replaced by oxyethyl, oxyamyl, oxymethyl, etc., compounds, acetyl disulphide, benzoyl disulphide, dithiobenzoyl disulphide, or xanthogenates such as mercuric ethyl, potassium amyl, zinc amyl, copper ethyl, zinc ethyl, barium ethyl, sodium methyl, lead methyl, zinc methyl, lithium ethyl, magnesium ethyl, calcium ethyl, potassium butyl, zinc butyl, potassium, sodium, or lead ethyl. Other amines may be used instead of aniline.

174,923. MANGANESE AND ITS ALLOYS. Aktiebolaget Ferrolegeringar, 1, Hamngatan, Stockholm. International Convention date, February 1, 1921.

Ores containing the higher oxides of manganese are smelted with sufficient carbon to reduce the manganese oxides to MnO, and the ore is then reduced with silico-manganese or

ferro-silicon. Iron oxides and phosphorus compounds in the ore may be reduced by adding additional carbon or iron respectively. Manganese alloys low in carbon and silicon are obtained by this process.

LATEST NOTIFICATIONS

177,494. Purification of the gases intended for the synthetic production of ammonia. Soc. Chimique de la Grande Paroisse (Azote & Produits Chimiques). March 25, 1921.
 177,495. Process for the improvement and regeneration of india-rubber. Hug, E. March 21, 1921.
 177,496. Process for rendering soluble crude phosphates. Rhenania Verein Chemischer Fabriken Akt.-Ges. and Rüssberg, Dr. F. March 23, 1921.
 177,516. Alloys of molybdenum with chemical, mechanical, and electrical qualities. Norske Molybdan-Produkter Aktieselskabet. March 26, 1921.
 177,525. Apparatus for feeding polyphase mercury vapour rectifiers. Akt.-Ges. Brown, Boveri et Cie. March 24, 1921.
 177,526. Manufacture of stable, dry, and readily-soluble vat preparations for dyeing. Farwerke vorm. Meister, Lucius & Brüning. March 26, 1921.
 177,536. Cellulose ester and process of forming the same. Phillips, A. W. March 24, 1921.

Specifications Accepted, with Date of Application

153,917. Tropinone-mono-carboxylic acid esters, Preparation of. E. Merck (Firm of) and O. Wolfs. August 23, 1919.
 155,259. Sulphur preparations of the thiophene series, Process for manufacturing from tar oils of bituminous rock rich in sulphur. H. Scheibler. April 28, 1914.
 155,302. Synthesis of ammonia, Process and apparatus for the direct. L'Air Liquide, Soc. Anon. pour l'Etude et l'Exploitation des Procédés G. Claude. December 15, 1919.
 156,118-9. Rubber-like substances, Process for the manufacture of. H. O. Trann's Forschungslaboratorium Ges. October 31, 1918.
 156,215. Anthraquinone and its derivatives, Manufacture of. Chemische Fabriken Worms Akt.-Ges. May 18, 1918.
 156,538. Anthraquinone, Manufacture of. Chemische Fabriken Worms Akt.-Ges. December 1, 1919.
 157,096. Classifying ores according to density, Apparatus for. E. P. F. Jalabert. December 26, 1919. Addition to 156,226.
 157,223. Saturators for producing solid salts by treatment of gases with liquid. C. Still (Firm of), August 8, 1919.
 158,558. Diethyl-barbituric acid compound, Manufacture of. Chemische Fabrik auf Aktien (vorm. E. Schering). January 26, 1920.
 176,819. Reduction of ores, Method of and apparatus for. A. E. Alexander. (Cobb Electro-Reduction Corporation of Canada, Ltd.). September 13, 1920.
 176,822. Solid fuel, Manufacture of, and distillation of tar. W. W. Stratford and S. Pick. September 16, 1920.
 176,833. Dyestuffs, Manufacture of. R. B. Ransford. (L. Cassella & Co., Ges. and R. Herz). October 14, 1920. Addition to 151,000.
 176,834-6. Furnaces for producing chemical changes. Woodall, Duckham & Jones (1920), Ltd., and Sir A. M. Duckham. October 14 and October 23, 1920.
 176,847. Recovering the volatile constituents of shale and like materials, Apparatus for. G. A. Bronder and T. Costigan. November 15, 1920.
 176,864. Chemical reactions by action of heat, Apparatus for producing. Thermal Industrial and Chemical (T.I.C.) Research Co., Ltd., and J. S. Morgan. December 8, 1920.
 176,918. Extraction of metallic compounds from blast furnace and like slags. A. Collier. September 23, 1921.
 176,924. Lead oxides and process of manufacture. G. Schimadzu. December 30, 1920.
 176,925. Oxy and sulpho-oxy derivatives of anthraquinone. D. Segaller, D. H. Peacock, and British Dyestuffs Corporation, Ltd. December 30, 1920.
 176,977. Ammonium sulphate, Manufacture of. South Metropolitan Gas Co. and P. Parrish. January 24, 1921.
 177,056. Evaporation, concentration, and drying of solutions of urea. A. L. Mond. (Metallbank und Metallurgische Ges.). March 17, 1921.
 177,067. Vacuum filters. W. Mauss. April 4, 1921.
 177,103. Finely-divided sulphur, Manufacture of. J. Y. Johnson. (Badische Anilin & Soda Fabrik). July 11, 1921.
 177,123. Lithopone, Manufacture of. J. L. Mitchell. September 1, 1920.

Applications for Patents

Baker Steam Motor Car & Manufacturing Co., and Golby, F. W. Hydrocarbon burner and method of obtaining combustible mixture of fuel and air. 8771. March 27.
 British Dyestuffs Corporation, Ltd., and Adams, E. B. Production of red basic dyestuffs. 9060. March 29.
 Cleary, E. Incandescent gas mantles. 9460. April 1.

Colman, H. G., Forwood, G. F., Yeoman, E. W., and Tapley, J. G. Treatment of hydrocarbons. 9316. March 31.
 Hallas, H. O., and Povey, H. Disintegrating, emulsifying, and colloiding materials. 9015. March 29.
 Hamaguchi, H. Compositions for washing off paint. 9176. March 30.
 Hannay, J. B. Process for manufacture of white pigment from lead ore. 9234. March 30.
 Hawkins, T. Process for manufacture of explosive. 8903. March 28.
 Hearson, J. W., and Lofthouse, A. G. Complete gasification plant. 9127. March 30.
 Law, H. D. Formaldehyde-producing apparatus. 9189. March 30.
 Lever Bros., Ltd., Tainsh, P. W., Thomas, R., and Williams, E. T. Manufacture of caustic soda. 9039, 9040. March 29.
 Lilienfeld, L. Manufacture of cellulose derivatives. 9465, 9466. April 1. (Austria, April 2, 1921.)
 Merck, E., [Firm of], Maeder, H., and Wolfs, O. Process for manufacture of nortropinone derivatives. 9461. April 1. (Germany, April 4, 1921.)
 Midland Coal Products, Ltd., and Fisher, A. Process of manufacturing smokeless, &c., fuel from coal. 9247. March 31.
 O'Neill, F. Plungers for glass furnaces. 8922. March 28.
 Plauson's (Parent Co.), Ltd., and Plauson, H. Manufacture of cellulose derivatives and fibrous products. 9265. March 31.
 Schmidt, A. Chlorination of cellulose lyes. 9223. March 31. (France, April 7, 1921.)
 Thompson, F. Dehydration of wet or raw peat. 9405. April 1.
 Wild, A. H. & R. Manufacture of ferro-chromium, &c., alloys. 9417, 9418. April 1.
 Zellstofffabrik Waldhof and Schneider, A. Process of recovering waste heat of gases and vapours. 9426. April 1. (Germany, April 11, 1921.)
 — Method of regenerating sulphurous acid and waste heat from sulphite-cellulose boilers. 9427. April 1. (Germany, April 27, 1921.)
 — Manufacture of fertilisers. 9428. April 1. (Germany, April 27, 1921.)

Increasing Use of Aluminium

In his speech at the annual meeting of the British Aluminium Co., Ltd., held on March 30 at Winchester House, Old Broad Street, London, Mr. A. W. Tait (the chairman) said the uses of aluminium in industry generally were increasing every day, and the research which had taken place and was all the time going on, particularly in alloys, had revealed certain valuable discoveries which, when thoroughly tested and brought into use, should increase substantially the demand for the metal. The period of depression through which they were passing was common in all industry, and the depression had probably been particularly acute in the metal industries generally. The non-ferrous metal industry, had also had the additional disadvantage of the competition created by the enormous amount of scrap metal which existed at the close of the war all over the world, and which had been finding its way into consumption during the past three years. This stock, however, was being gradually absorbed, so that in time the market would be in a more healthy condition.

Indian Imports of Dyes

ACCORDING to statistics forwarded by H.M. Senior Trade Commissioner in India, the total imports of coal tar dyes during the nine months ended December 31, 1921, were 2.06 crores as against 2.26 in the corresponding period of the previous year. Although the imports from the United Kingdom advanced from .55 to .58 crore, the values were swollen by dyestuffs imported, on reparation account, which originated in Germany. Direct shipments from Germany increased from .71 to .92 crore, and German dyestuffs, on account of the low Exchange, are successfully competing in all Indian markets.

New Acid-proof Textile Material

THE destructive effects of strong acids upon the clothing of workers in chemical, gas, and similar works are well known, as accidental splashing is inevitable, and the need of a really acid-proof textile material for making up into laboratory coats or overalls, leggings, aprons, and similar garments has long been recognised. The Manchester firm of T. W. Storey and Morris, Victoria Buildings, claim to have produced a material which has proved highly resistant even to concentrated sulphuric and nitric acids. It has been tried in many large works, and is said to answer the purpose efficiently.

Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

LONDON, APRIL 6, 1922.

THE spot market in chemicals generally has been quite active during the past week, and in many cases a shortage of supplies for early delivery is becoming apparent.

Buyers still show considerable reluctance in purchasing forward, but there is no question but that markets are in a much healthier state.

The continued depression in the mark has had little or no effect upon prices.

Export trade remains particularly uninteresting.

General Chemicals

ACETONE has been in good demand at recent price.

ACID ACETIC is still taken up, and supplies for early delivery are scarce. Price is tending upwards.

ACID CITRIC has maintained its recent advance, and the demand is fair.

ACID FORMIC continues in steady request. Price unchanged.

ACID LACTIC has been rather more inquired for, but buying is of the hand-to-mouth variety.

ACID OXALIC is in fair demand, without change in price.

ACID TARTARIC.—More interest is being taken in this article on speculative account, but the general tendency remains uncertain.

BAARIUM CHLORIDE is still inquired for, and stocks command a substantial premium. Makers are sold out for some time ahead.

CREAM OF TARTAR remains a firm market, and a satisfactory volume of business is reported.

FORMALDEHYDE is a slow but steady market; there is little, if any, fluctuation in price.

LEAD ACETATE.—The improvement in demand is maintained, and some makers seem to be well sold for early delivery.

LEAD NITRATE is unchanged.

LITHOPONE is very slow in demand; price nominally unaltered.

POTASSIUM CARBONATE.—A better export demand has been experienced, and the prices are rather firmer.

POTASH CAUSTIC is very weak owing to the complete absence of buyers.

POTASH PERMANGANATE.—There is a steady trade of small dimensions. Stocks are light, and the price is exceedingly firm.

SODA ACETATE is an active market, with makers well sold ahead.

SODA BICHROMATE.—In spite of the reduction in price, the market remains stagnant.

SODA BISULPHITE is still inquired for, and the position is becoming difficult for near delivery.

SODA NITRITE has been in better request, although the turnover is far below normal.

SODA PRUSSIATE.—Makers have nothing to offer in any reasonable position, and a higher level of prices is not unlikely.

ZINC OXIDE has been in good demand, and a substantial business is passing.

Coal Tar Intermediates

THE actual volume of business passing continues small, but on the other hand there are distinct signs of improvement. It is obvious that resale parcels of a large number of intermediates are exhausted.

ALPHA NAPHTHOL has been fairly quiet on home account, but export inquiries have been received.

ALPHA NAPHTHYLAMINE is firm at last quoted price, with steady business passing.

ANILINE OIL AND SALT go steadily into consumption at makers' prices.

BENZIDINE BASE is without change in value.

BETA NAPHTHOL is steady on home account, and inquiries have been received for export.

DIPHENYLAMINE is very firm, and orders have been placed.

"H" ACID has been in demand and is firm at quoted price.

NAPHTHIONIC ACID is steady, and orders have been placed on home account.

NITRO BENZOL has been inquired for, and a small business is passing.

PARANITRANILINE.—Business has been done, and this article is without change in value.

"R" ACID is without feature.

RESORCIN.—Some orders have been placed, and the price is steady.

Coal Tar Products

THE market for coal tar products seems to have taken a turn, and there is a little fresh business doing.

90's BENZOL is weak, and is worth not more than 2s. 1d. per gallon on rails in the North.

PURE BENZOL is also weak, and is worth 2s. 7d. on rails in the North and 2s. 11d. in the South.

CREOSOTE OIL seems to be slightly more active, although the price shows no improvement. It is worth about 4*1*d. per gallon on rails in the North and 5d. in the South.

CRESYLIC ACID is quoted at 2s. on rails for the pale quality, and the dark is worth 1s. 9d. on rails.

SOLVENT NAPHTHA can be bought at 2s. 1d. per gallon.

HEAVY NAPHTHA is slightly more active, and is worth about 2s. on rails.

NAPHTHALENE is weak, and the crude qualities are worth from £5 to £7, while the refined is worth £15 per ton.

PITCH.—The position is unchanged; the demand is slow, but prices remain unchanged.

Sulphate of Ammonia

There are no new features to report.

Current Prices

Chemicals

	Per	£	s.	d.	Per	£	s.	d.
Acetic anhydride.....	lb.	0	1	10	to	0	2	0
Acetone oil	ton	77	10	0	to	80	0	0
Acetone, pure.....	ton	77	10	0	to	80	0	0
Acid, Acetic, glacial, 99-100%.....	ton	55	0	0	to	60	0	0
Acetic, 80% pure	ton	47	0	0	to	48	0	0
Arsenic	ton	90	0	0	to	95	0	0
Boric, cryst.....	ton	60	0	0	to	65	0	0
Carbolic, cryst. 39-40%.....	lb.	0	0	6 <i>1</i> ₂	to	0	0	7
Citric	lb.	0	2	0	to	0	2	0
Formic, 80%	ton	72	10	0	to	75	0	0
Gallic, pure.....	lb.	0	3	4	to	0	3	6
Hydrofluoric	lb.	0	0	8 <i>1</i> ₂	to	0	0	9
Lactic, 50 vol.....	ton	40	0	0	to	43	0	0
Lactic, 60 vol.....	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.....	ton	30	0	0	to	31	0	0
Oxalic	lb.	0	0	8 <i>1</i> ₂	to	0	0	9
Phosphoric, 1.5	ton	43	0	0	to	45	0	0
Pyrogallic, cryst.....	lb.	0	6	6	to	0	6	9
Salicylic, Technical	lb.	0	0	10 <i>1</i> ₂	to	0	1	0
Salicylic, B.P.....	lb.	0	1	4	to	0	1	6
Sulphuric, 92-93%.....	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	2	9	to	0	3	0
Tartaric	lb.	0	1	4	to	0	1	4
Alum, lump.....	ton	12	10	0	to	13	0	0
Alum, chrome.....	ton	30	10	0	to	32	0	0
Alumino ferric.....	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%.....	ton	12	0	0	to	13	0	0
Aluminium sulphate, 17-18%.....	ton	13	10	0	to	14	10	0
Ammonia, anhydrous.....	lb.	0	1	8	to	0	1	10
Ammonia, .880.....	ton	35	0	0	to	37	0	0
Ammonia, .920.....	ton	22	0	0	to	24	0	0
Ammonia, carbonate.....	lb.	0	0	4	to	—	—	—
Ammonia, chloride.....	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers).....	ton	35	0	0	to	37	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	90	0	0	to	95	0	0
Ammonia, sulphocyanide.....	lb.	0	3	0	to	—	—	—
Amyl acetate	ton	175	0	0	to	185	0	0
Arsenic, white, powdered.....	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%.....	ton	12	10	0	to	13	0	0

	Per	£	s.	d.	Per	£	s.	d.
Barium, Chlorate	lb.	0	0	11	ton	0	1	0
Chloride	ton	16	0	0	to	17	10	0
Nitrate	ton	32	0	0	to	35	0	0
Sulphate blanc fixe, dry	ton	24	0	0	to	25	0	0
Sulphate, blanc fixe, pulp	ton	15	0	0	to	16	0	0
Sulphocyanide, 95%	lb.	0	1	6	to	—		
Bleaching powder, 35-37%	ton	13	0	0	to	13	10	0
Borax crystals	ton	29	0	0	to	33	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
Grey	ton	11	0	0	to	12	0	0
Calcium Carbide	ton	16	0	0	to	17	0	0
Chloride	ton	7	10	0	to	8	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	75	0	0	to	80	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	11	0	to	0	11	6
Oxide, black	lb.	0	10	6	to	0	11	0
Copper chloride	lb.	0	1	3	to	0	1	0
Sulphate	ton	28	10	0	to	29	0	0
Cream Tartar, 98-100%	ton	120	0	0	to	125	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde, 40% vol	ton	72	10	0	to	75	0	0
Formosol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	4	5	0	to	4	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols	gal.	0	2	5	to	0	2	6
Iron perchloride	ton	30	0	0	to	32	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	42	0	0	to	43	0	0
Carbonate (White Lead)	ton	40	0	0	to	44	0	0
Nitrate	ton	46	10	0	to	48	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	24	0	0	to	25	0	0
Magnesium chloride	ton	10	0	0	to	10	10	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	8	0	0	to	8	10	0
Sulphate (Druggists)	ton	13	10	0	to	14	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	72	0	0	to	73	0	0
Nickel sulphate, single salt	ton	61	0	0	to	62	0	0
Ammonium sulphate, double salt	ton	62	0	0	to	64	0	0
Potash, Caustic	ton	34	0	0	to	35	0	0
Potassium bichromate	lb.	0	0	7	to	—		
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride 80%	ton	15	0	0	to	20	0	0
Chlorate	lb.	0	0	4	to	0	0	5
Meta bisulphite, 50-52%	ton	84	0	0	to	90	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	0	9	to	0	0	10
Prussiate, red	lb.	0	3	9	to	0	4	0
Prussiate, yellow	lb.	0	1	2	to	0	1	2
Sulphate, 90%	ton	20	0	0	to	22	0	0
Salammoniac, firsts	cwt.	3	5	0	to	—		
Seconds	cwt.	3	0	0	to	—		
Sodium acetate	ton	25	0	0	to	26	0	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	5	to	—		
Bisulphite, 60-62%	ton	25	0	0	to	27	10	0
Chlorate	lb.	0	0	3	to	0	0	4
Caustic, 70%	ton	23	10	0	to	24	0	0
Caustic, 76%	ton	25	0	0	to	25	10	0
Hydrosulphite, powder, 86%	lb.	0	2	3	to	0	2	6
Hypersulphite, commercial	ton	13	10	0	to	14	0	0
Nitrate, 96-98%	ton	32	0	0	to	34	0	0
Phosphate, crystal	ton	19	10	0	to	20	0	0
Perborate	lb.	0	1	3	to	0	1	4
Prussiate	lb.	0	0	9	to	0	0	10
Sulphide, crystals	ton	13	0	0	to	14	0	0
Sulphide, solid, 60-62%	ton	21	10	0	to	23	10	0
Sulphite, crystal	ton	13	0	0	to	14	0	0
Strontium carbonate	ton	60	0	0	to	65	0	0
Strontium Nitrate	ton	60	0	0	to	62	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	25	0	0	to	27	10	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	8	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Perchloride, solid	lb.	0	1	5	to	0	1	7
Protocloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride, 102 Tw.	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	35	0	0	to	40	0	0
Oxide, 99%	ton	38	0	0	to	40	0	0
Dust, 90%	ton	45	0	0	to	47	10	0
Sulphate	ton	18	10	0	to	19	10	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.	Per	£	s.	d.
Alphanaphthol, crude	lb.	0	2	3	ton	0	2	6
Alphanaphthol, refined	lb.	0	3	0	to	0	3	3
Alphanaphthylamine	lb.	0	2	0	to	0	2	3
Aniline oil, drums extra	lb.	0	1	0	to	0	1	1
Aniline salts	lb.	0	1	1	to	0	1	2
Anthracene, 40-50%	unit	0	0	8	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	9	to	0	4	3
Benzidine, base	lb.	0	5	9	to	0	6	0
Benzidine, sulphate	lb.	0	5	9	to	0	6	0
Benzoic acid	lb.	0	1	7	to	0	1	9
Benzooate of soda	lb.	0	1	6	to	0	1	7
Benzyl chloride, technical	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate	lb.	0	4	9	to	0	5	0
Betanaphthol	lb.	0	1	9	to	0	2	0
Betanaphthylamine, technical	lb.	0	6	0	to	0	7	0
Croceine Acid, 100% basis	lb.	0	3	6	to	0	3	9
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	2	3	to	0	1	4
Dinitrobenzol	lb.	0	1	3	to	0	1	5
Dinitronaphthaline	lb.	0	1	4	to	0	1	5
Dinitrotoluol	lb.	0	1	5	to	0	1	6
Dinitrophenol	lb.	0	2	9	to	0	3	0
Dimethylaniline	lb.	0	2	6	to	0	2	9
Diphenylamine	lb.	0	4	3	to	0	4	6
H-Acid	lb.	0	6	6	to	0	7	0
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	0	to	0	6	6
Monosulphonic Acid (2.7)	lb.	0	5	6	to	0	6	6
Naphthionic acid, crude	lb.	0	3	3	to	0	3	6
Naphthalonate of Soda	lb.	0	3	3	to	0	3	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	0	to	0	4	3
Neville Winther Acid	lb.	0	7	9	to	0	8	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	0	to	0	1	2
Orthoamidophenol, base	lb.	0	10	0	to	0	10	5
Orthodichlorbenzol	lb.	0	1	0	to	0	1	1
Orthotoluidine	lb.	0	1	6	to	0	1	9
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	10	0	to	0	10	6
Para-amidophenol, hydrochlor	lb.	0	10	6	to	0	11	0
Paradichlorbenzol	lb.	0	0	6	to	0	0	7
Paranitraniline	lb.	0	3	6	to	0	3	9
Paranitrophenol	lb.	0	2	3	to	0	2	6
Paranitrotoluol	lb.	0	5	0	to	0	5	3
Paraphenylenediamine, distilled	lb.	0	10	6	to	0	10	9
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	2	9	to	0	3	0
Resorcin, technical	lb.	0	5	6	to	0	6	0
Resorcin, pure	lb.	0	7	3	to	0	7	6
Salol	lb.	0	2	4	to	0	2	6
Sulphanilic acid, crude	lb.	0	1	0	to	0	1	1
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

Alsation Potash

The Alsace-Lorraine Trading and Development Co. report that the volume of trade in potash fertilisers shows a marked improvement in comparison with the restricted turnover during this season last year. There is some indication that prices for the more popular forms of potash have reached low ebb, although the more concentrated grades may possibly show a slight decline if the cost of production can be lowered. Current quotations for the various grades of potash are as follows:

	£	s.	d.	£	s.	d.
French Kainit 14%	2	7	6	—	12	6
Sylvinite 20%	3	12	6	“	“	“
Sylvinite 30%	5	12	6	“	“	“
Muriate of Potash 50%	10	10	0	“	“	“
Sulphate of Potash 90% purity	14	10	0	“	“	“

During the past week the bulk of the potash sold has been in the form of kainit 14% and sylvinite 20%, and large cargoes of these grades are now being sent forward from the French mines.

The Future of Gretna

It is reported that the Government have decided to divide the Gretna Factory into sections for the purposes of sale by private treaty. Care has been taken in the division to preserve the potentialities of each section.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

GLASGOW, APRIL 6, 1922.

THERE has been little or no improvement in the amount of business during the past week.

Manufacturers advise a reduction in the price of soda crystals and bicarbonate of soda of 10s. per ton; also in chloride of lime of 20s. per ton. Continental offers of the last named are still considerably lower than home makers' prices.

In coal tar products and intermediates there is nothing special to report.

Industrial Chemicals

ACID ACETIC.—Market firm. Glacial quoted at £57 to £58 per ton. 80% Technical £46 to £47 per ton. 80% B.P. at £47 to £48 per ton. Continent offers at £32 per ton in carboys (demi-johns) for 80% Pure, exclusive of duty.

ACID FORMIC.—Slight demand for 85%. Quoted £66 to £67 per ton. 90% offered at £70 per ton ex works.

ACID HYDROCHLORIC.—Still in poor demand. Makers' prices unchanged at 6s. 6d. per carboy ex works.

ACID OXALIC.—Market firm. Spot lots to be had at 8½d. per lb. Continent offers 98/100% White Crystals at 6½d. per lb.

ACID SULPHURIC.—Business very poor. Makers' prices unchanged. Full wagon loads in carboys 144° at £4 per ton. 168° at £7 5s. per ton. Dearnsenical £1 per ton more.

ALUM POTASH.—In moderate request. Spot lots at £15 per ton ex store. Continent offers at £12 per ton c.i.f. U.K. ports.

ALUMINA SULPHATE.—Very low Continental offers, 14/15% at £8 10s. per ton. 17/18% at £10 7s. 6d. c.i.f. U.K. ports. Spot lots about £13 to £14 for 14/15%.

AMMONIA CARBONATE (POWDERED).—Quoted at £20 5s. per ton in casks c.i.f. U.K. ports.

AMMONIA MURIATE.—Still in fair demand. Price £34 10s. per ton f.o.r.

AMMONIA, SALAMMONIAC.—Price steady at £58 per ton, but little demand.

AMMONIA SULPHATE.—25½% at £15 10s. per ton. 25¾% at £16 13s. per ton ex works to buyers' own vehicles.

ARSENIC, WHITE CORNISH.—Slight inquiry but little business to record. Price £40 to £41 per ton ex quay.

BARIUM CHLORIDE.—English makers quoting £16 per ton.

BARYTES.—Finest white quality at £6 per ton f.o.r. works. Good qualities on offer at £4 per ton.

BLEACHING POWDER.—Slight local demand. Spot lots at £14 to £15 per ton ex station. Continent offers 35/37% at £10 15s. c.i.f. English port.

CALCIUM CARBIDE.—Price remains unchanged at £20 per ton ex store. Cheap Continental offers of £17 per ton c.i.f. U.K.

CALCIUM CHLORIDE.—Home makers' prices at £6 10s. ex quay or station. Cheaper offers from the Continent.

FORMALDEHYDE (40% BY VOL).—Inquiry slight. Spot lots at £73 to £75 per ton.

GLAUBER SALTS.—In fair demand. Commercial quality at £5 10s. to £6 per ton ex store. Calcined at £11 per ton delivered.

LEAD (RED).—£34 10s. per ton ex station. Practically no demand.

LEAD (WHITE).—£49 per ton ex station. Practically no demand.

LEAD ACETATE.—Remains unchanged. Makers quote White Crystals at £42 per ton. Brown at £33 per ton. Cheaper offers from the Continent.

MAGNESITE.—Fair inquiry. Spot lots at £12 per ton ex store.

MAGNESIUM CHLORIDE.—Spot lots to be had at £8 10s. ex store. In fair demand.

MAGNESIUM SULPHATE (EPSOM SALTS).—In moderate request. Commercial quality at £9 5s. per ton. B.P. quality at £10 10s. per ton delivered.

POTASSIUM CARBONATE.—90/92%. Very little inquiry. Spot lots at £26 per ton ex station. Continent offers 96/98% at £27 5s. c.i.f. U.K.

POTASSIUM CAUSTIC.—88/92%. Price for spot lots £33 to £34 per ton. Little demand. Continent offers in drums at £30 per ton c.i.f. U.K.

POTASSIUM CHLORATE.—Makers quoting at 4½d. per lb.

POTASSIUM NITRATE.—Moderate inquiry. Price £38 to £40 per ton ex store.

POTASSIUM PERMANGANATE.—In fair demand. Price 9½d. to 10d. per lb. Continent offers Crystals at 6½d. per lb. c.i.f. U.K. port.

SODIUM BICARBONATE.—Makers have reduced price 10s. per ton from April 1. Refined now £11 per ton ex station or quay. M.W. quality £1 per ton less.

SODIUM CARBONATE (REFINED ALKALI).—Demand still very poor. Spot lots at £9 12s. 6d. ex station.

SODIUM CARBONATE (SODA CRYSTALS).—Makers advise a reduction in price of 10s. per ton. Price now £6 per ton ex station or quay.

SODIUM CAUSTIC.—No change in price and poor demand. 76/77% at £25 10s. 70/72% at £23 10s. 60% (broken) at £26 per ton ex station.

SODIUM HYPOSULPHITE.—Fairly good demand. Pea Crystals at £20 per ton. Commercial quality at £14 to £15 per ton ex store.

SODIUM NITRATE.—Market firm. Makers quote slightly higher at £15 per ton. Refined quality 5s. more.

SODIUM SILICATE, 140°.—Price unchanged at £10 to £11 per ton ex station. Little inquiry. 58/60° Be filtered in casks £8 15s. c.i.f. U.K.

SODIUM SULPHATE (SALTCAKE 95%).—£4 per ton. Quantities to be had at £3 17s. 6d. f.o.b. for export.

SODIUM SULPHIDE, 60/65% SOLID.—Makers quoting slightly cheaper at £19 10s. per ton f.o.b. for export. Home price, £21 per ton ex station. Continent offers 60/66% Solid in drums at £20 per ton c.i.f. U.K.

SODIUM SULPHITE CRYSTALS.—Practically no inquiry. Price £13 10s. per ton ex station.

SULPHUR ROLL £13 per ton
SULPHUR ROCK £12 per ton
SULPHUR GROUND £13 per ton
SULPHUR FLOWERS £14 per ton

Rather better inquiry for roll, but little business being done.

TIN CRYSTALS.—Quoted at 1s. 3d. per lb.

ZINC CHLORIDE.—Solid at £35 to £37 per ton. Continent offers fused in lead-lined drums at £18 10s. c.i.f. U.K.

WAX PARAFFIN.—125/127° at 2½d. per lb. carriage paid.

WAX SCALE.—1½d. per lb. c.i.f. U.K.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

ALPHANAPHTHYLAMINE.—Some inquiries. Price quoted 20s. per lb. f.o.b. English port.

ALPHANAPHTHOL.—Some inquiries for export. Price quoted 2s. 9d. per lb. f.o.b. English port.

BENZIDINE DISULPHONIC ACID.—Small inquiry. Price quoted 9s. 9d. per lb. carriage paid, drums included.

BENZIDINE BASE.—A few export inquiries. Price quoted 6s. 6d. per lb. 100% basis.

BETA NAPHTHOL.—Small inquiry at 1s. 5d. per lb. carriage paid.

DIMETHYLANILINE.—Some business passed at 2s. 9½d. per lb., drums included.

DINITROCHLORBENZOL.—Some inquiries. Price £90 per ton f.o.b. U.K.

DIPHENYLAMINE.—Some inquiries. Price 4s. 3d. per lb. delivered.

GAMMA ACID.—Small business passed at 15s. per lb. 100% basis.

"H" ACID.—A few inquiries for export quoted at 7s. per lb. 100% basis.

METAPHENYLENEDIAMINE.—Some inquiries for export. Price quoted 6s. 6d. per lb. f.o.b. English port.

MONOCHLORBENZOL.—A few inquiries. Price quoted £80 per ton f.o.b.

NAPHTHIONATE OF SODA.—Some business passing around 3s. 3d. per lb. delivered, 100% basis.

PHTHALIC ANHYDRIDE.—Quoted at 2s. 10d. per lb. delivered.
PARADICHLORBENZOL.—Some inquiries. Price quoted £50 per ton f.o.b. U.K.
PARANITRANILINE.—Some inquiry. Price 3s. 6d. per lb. carriage paid.
SALICYLIC ACID, TECHNICAL.—Some business passing at 8½d. per lb. f.o.r. works.
TOLIDINE BASE.—Some inquiries. Price quoted 7s. per lb. 100% basis f.o.b.

German Chemical Trade Notes

FROM OUR OWN CORRESPONDENT.

Berlin, April 3, 1922.

THE firm tone which characterised the German chemical market last week has been maintained, and business during the week has improved. The active demand is forcing up prices to higher levels. Factors contributing to a pessimistic feeling with regard to export trade are the tendency of German prices to reach those of competitors, and the reluctance of foreign buyers to receive quotations in their own currency where the exchange is against Germany. In addition to the 21 per cent. advance in potash prices, referred to in my last report, there is a possibility of a further increase of 4.4 per cent. as from April 1. The Government has licensed the export of considerable quantities of 40 per cent. and 20 per cent. potash fertilisers to Poland. It is understood that the prices will be about half those paid by Polish consumers for the Alsatian salts. The German salts will only be supplied to consumers who have not previously purchased the Alsatian product. The domestic demand for nitrogenous fertilisers is brisk. Stocks are depleted and deliveries are only from current production. No fewer than 5,000 tons of nitrogen have recently been imported, the prices now quoted ranging from 73 to 94 marks per kilogram.

The Badische Anilin u. Sodaefabrik have laid a complaint before the Reichswirtschaftsrat regarding the inadequacy of coke supplies for their plant at Merseburg, which has a daily output of 500 tons of nitrogen. The committee have decided to assist the company by allowing it to have privileged supplies of coke.

Industrial chemicals find a ready market, although holders of salt cake, alkalis, and several other products are of the opinion that spot goods are preferable to cash. Trade in fine chemicals has been generally satisfactory, potassium bromide, glycerine, benzoic acid and tartaric acid being favoured products. The market for coal tar products is firm, and export trade is moving along routine lines. The following quotations are given in marks per kilogram (d. = domestic price; e. = export price).

Acetic acid, 80%, has been neglected at 35 mk. d., 45 mk. e.; glacial, 98/100%, very scarce; small parcels are offered at 50 mk. d., 60 mk. e. Acetyl-Salicylic acid—a firm market with a rising tendency at 280 mk. d.; 360 mk. e. Benzoic acid, 110 mk. d.; 130 mk. e. Boric acid, refined, crystallised, 92.25 mk. d.; powdered 94.25 mk. d.; fair demand from abroad. Citric acid—the tendency is firm at 320 mk. d.; 360 mk. e. Formic acid, 85%, technical, 28 mk. d. Lactic acid, 50%, technical, 25.75 mk. d. Oxalic acid—firmer at 80 mk. d.; in brisk demand for export. Salicylic acid is meeting with a ready market at 155 mk. d. Tartaric acid, crystallised and powdered, 140/145 mk. d.; offerings from second hand at 160 mk. d.; 220 mk. e. Alumina Sulphate, 14/15%, 8 mk. e. Ammonia Bicarbonate, powdered—numerous transactions caused a firming-up tendency at 28 mk. d.; in lumps 36 mk. d. Ammonia Carbonate, powdered, 17/20 mk. d.; 27/30 mk. e.; fair interest shown from abroad. Borax—Convention prices advanced to: refined crystallised, 46.50 mk. d.; powdered 47.50 mk. d.; trade prices are: crystallised 45 mk. d.; powdered, 46 mk. d.; tendency firm. Calcium Carbonate, 10 mk. d. Copper Sulphate, 33/36 mk. d.; 42 mk. e. Potassium Caustic, 88/92%, 30 mk. d.; 40 mk. e. Potassium Chlorate, 30/34 mk. d.; 37/39 mk. e. Sodium Bicarbonate, 6.25/7.50 mk. d.; 15/19 mk. e. Sodium Caustic, 125/128%, 34 mk. d.; 39 mk. e. Sodium Cyanide, 110 mk. d.; 120 mk. e. Sodium Sulphide, 60/62%, 24 mk. d. Sulphur, in lumps, 10.50 mk. d. Bone Glue, 52 mk. d. Dextrose, yellow, 39 mk. d. Lead, red, pure, 42.50 mk. d.; commercial, 36.50 mk. d.; 44 mk. e. Lead, white, powdered, 40 mk. d.; 44 mk. e.; in oil, 39 mk. d.; 42 mk. e. Lithopone, 16/17 mk. d.; 24 mk. e. Skin Glue, A1 quality, 70 mk. d. Zinc White—Convention prices advanced to: white-seal, 39.30 mk. d.; green-seal, 37.80 mk. d.; red-seal, 36.30 mk. d.; Market quotations are: red-seal, 36 mk. d.; 43 mk. e.; green-seal, 37 mk. d.; 45 mk. e. Benzaldehyde, almost free from chlorine, 75 mk. d.; 85 mk. e. Benzol, in brisk demand, in spite of high quotations, from 28/34 mk. d. Beta Naphthol, technical, 52.50 mk. d.

Manchester Chemical Market

Monthly Report by Sir S. W. Royse & Co., Ltd.

DURING March the demand both for home and export has fallen away somewhat, and business done has been only on a moderate scale and chiefly for near delivery. The inquiry from the textile trades has been poor, but recently some improvement has been noticeable. The dispute in the engineering trade has not so far had much effect on business generally, but its continuance and possible extension may have serious consequences.

There has been a rather better inquiry for sulphate of copper, both for home and export account, but little change in price. The returns show 3,942 tons exported last month, which is well below the figures for January, but slightly higher than those for February, 1921, when shipments were 3,181 tons. Supplies of green copperas are still in excess of demand. Acetates of lime are scarce, and acetic acid has been selling well. Acetate of soda is firmer with reduced stocks, but there has been little call for acetates of lead and nitrate of lead. Carbonate of potash has been arriving in increased quantities, but there is a fair inquiry and prices are unchanged. Caustic potash is also in better supply, without variation in price. The demand for muriate and sulphate of potash continues good. Montreal potashes have been pressed for sale. Yellow prussiates of potash and soda have been in steady request and values have remained firm. Foreign white powdered arsenic has been offering at low prices, but trade has been confined to small lots. A good business has been passing in tartaric acid and cream of tartar, and values are higher. Some good sales have also been made in citric acid for delivery well ahead, and there is a strong export inquiry. Bichromates of potash and soda have been reduced 1d. per lb., resulting in a better call. Oxalic acid is easier. The lower prices ruling for borax and boracic acid have not stimulated demand, and stocks have accumulated at makers' works. Phosphate of soda has been quietly steady. The demand for alum and sulphate of alumina is still very slow, but Continental makers are now asking higher figures. There has been some falling away in the export demand for muriate of ammonia and sal ammoniac, whilst the home trade requirements are small. Ammonia alkali has been reduced 2s. 6d. per ton, and bleaching powder 1d. per ton for the home trade, and both are in fair demand. White caustic soda is in moderate inquiry. Saltcake is in good request for export.

There is little change to report in the tar products market. Benzols and toluols are, if anything, easier, due to increased production through opening up of coke-ovens. Solvent naphtha is exceedingly quiet and, with the larger output, the tendency is for still lower values. Creosote remains dull, with more plentiful supplies. There is no change in carbolic acid. Naphthalenes of all qualities are without inquiry. Pitch continues firm without much alteration in values. Sulphate of ammonia is in good demand, and the production is readily absorbed by home consumption. At the same time there is a fair export inquiry.

Chemical Trade Wages Position

A MEETING of the Chemical Trade Joint Industrial Council was held in London last week, Mr. Roscoe Brunner presiding, when the men's representatives requested the employers to withdraw the reduction of the third penny on April 1. The employers replied that they were quite unable to hold up the cut, as economic reasons would not allow of the maintenance of wages at their present level. The Unions concerned have recommended their members to resist the reduction. On Thursday a representative of THE CHEMICAL AGE was informed at the headquarters of the Workers' Union that the workers did not intend to submit to the reduction, but that, so far as was known, no definite action regarding a stoppage had yet been taken, except, of course, in Wales.

The tinplate industry is likely to be seriously menaced by the latest development in the strike of Welsh chemical workers. Up to last week the tinplate works had been obtaining their supplies of acid from sources outside the area of the dispute, but the position is now altered owing to the extension of the trouble and the decision reported to have been come to by the trade unions in association in South Wales. Mr. David Burnham, the secretary of the South Wales Chemical Workers, stated during last week-end that the unions had so far held their hands in regard to tinplate works, but a policy had now been adopted which would cut off any further supplies, and this meant the tinplate industry would in a short time be seriously affected.

Company News

AMALGAMATED ZINC (DE BAVAY'S).—A dividend of 1s. per share will be paid on April 13.

ASSOCIATED PORTLAND CEMENT MANUFACTURERS, LTD.—The directors recommend a dividend of 5 per cent. on the ordinary shares for the year ended December 31 last, carrying forward £224,043.

ASBESTOS CORPORATION OF CANADA.—Cabled advice has been received that dividends have been declared of \$1 1/4 per share on the preferred stock and \$1 1/2 per share on the common stock, both for the quarter to March 31, payable on April 15.

ARGHAN CO., LTD.—At an extraordinary general meeting held on Monday resolutions to increase the capital of the company from £40,000 to £100,000 in two-shilling shares, of which 400,000 should at once be issued were unanimously agreed to.

RECKITT & SONS.—A further dividend of 1s. per share, plus a bonus of 6d. per share is announced, making 3s., or 15 per cent., for the year. £100,887 is placed to reserve, leaving £159,753 to be carried forward subject to corporation profits tax.

THARSIS SULPHUR & COPPER CO.—Having regard to the present conditions of trade, the directors have decided not to recommend the payment of a dividend from the profits for 1921, but to carry forward the credit balance of £73,101. In 1920 a dividend of 15 per cent., less tax, was paid.

SALT UNION, LTD.—At the annual meeting held on March 29, it was announced that it was intended to hold a special meeting of the "B" debenture stock-holders, who would be asked, with the approval of the trustees, to pass a resolution which, if agreed to, would have the effect of winding-up the "B" debenture trust. When that was done the intrinsic value of their security as shareholders in the Salt Union would be enhanced.

BEDE METAL AND CHEMICAL CO., LTD.—The report for the year to December 31 last states that the operations, after allowing for general management expenses and income tax, resulted in a loss of £38,216 os. 5d. To this must be added the debit balance brought forward from the previous year, after payment of directors' fees for 1920, £2,945 14s. 8d., leaving at the debit of the profit and loss account £41,161 15s. 1d. The loss is attributed mainly to the depreciated value of copper.

SAPON SOAPS, LTD.—The report for the year to September 30 last states that the working resulted in a loss of £8,131. It is proposed that an arrangement be entered into with Peter Lunt & Co., soap makers, of Liverpool, under which that firm will manage the business. A condition of the agreement is that the existing liabilities shall be paid off and funds provided for working capital. An issue of £25,000 second debentures of £5 each, carrying interest at 10 per cent. per annum, is to be made for this purpose.

BRITISH CELLULOSE AND CHEMICAL MANUFACTURING CO., LTD.—It is announced that the statements which have appeared in some portions of the Press concerning the financial reorganisation of the company are inaccurate. Negotiations affecting the future of the company are, however, being conducted, and the directors hope that these will be concluded in time to enable them to send out the company's annual report and balance-sheet on April 13. In that event the annual meeting will be called for April 21.

JOSEPH NATHAN & CO., LTD.—Interim dividends each of 4 per cent. actual, less tax, for the six months to March 31, 1922, have been declared on the 8 per cent. cumulative participating preferred ordinary and ordinary capital. Warrants will be posted on April 29. The annual report and accounts will be issued during April, when the annual general meeting will be held. The directors will recommend the payment on April 29 on preferred ordinary and ordinary of a final participatory dividend, making 10 per cent. on each of these classes of shares, less tax, for the year to September 30, 1921.

MASON & BARRY, LTD.—The report for 1921 states that the profit was £115,772, including £18,000 refund of income tax, to which is added £20,205 brought forward. It is proposed to pay a dividend of 40 per cent. (or 8s. per share), less tax, and a bonus on account of refund of income tax of 10 per cent. (or 2s. per share), free of tax; to place to staff pension fund

£5,000; and to carry forward £38,392. The total quantity of ore broken and raised during the year was 1,482,61 tons (as against 93,812 tons in 1920), and the shipments (inclusive of ore from the cementation works) amounted to 204,400 tons (against 226,739 tons). The average market price of standard copper in 1921 was £69 8s. 8d. per ton, as against £97 12s. 4d. in 1920. In 1920 profits were £67,685; a dividend of 25 per cent. was paid (or 5s. per share), less tax; and £5,000 was placed to pension fund. The annual meeting will be held at the Cannon Street Hotel, London, on April 12, at 2 p.m. The transfer books are closed until April 24.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
Australia	Sulphate of copper, dry cells, ammonium chloride, porous cells	D.O.T. 8274/ E.D. / P.N.
Montreal	Druggists' sundries	363
Ontario	Vegetable oils and lubricating greases	—
Cape Town ..	Paints and varnishes	367
Egypt	Palm oil and soft soap	Mech. 1922/3/8
Nova Scotia..	Lithopone and ground white barytes	
India	Perfumery and essences	D.O.T. 769/49/ F.G. / S.C.
Amsterdam ..	Artificial manures	—
Czecho- Slovakia ..	Raw materials for manufacture of soap	D.O.T. 769/37/ F.G. / S.C.
Buenos Aires	Perfumery and essences	

Tariff Changes

FRANCE.—It is reported that the Commission for the revision of the coefficients of increase has decided in favour of an eventual increase in the coefficients on dyestuffs from three to six. Dyestuffs not yet manufactured in France would, however, continue to pay the old duties.

AUSTRALIA.—The operation of the revised Customs duty on citric acid, which was to have come into force on March 31, has been postponed until June 30.

grenada.—Revised forms of certificates of origin and value are contained in a report (Cmd. 1,231, price 2d.) which is obtainable from H.M. Stationery Office. A schedule of revised Customs duties which increase (on a large number of articles) the British Preferential rates from 10 per cent. *ad valorem* to 15 per cent. *ad valorem*, may be inspected at the Tariff Section of the Department of Overseas Trade.

NEW ZEALAND.—Particulars of a new Customs interpretation of oils were published in the Board of Trade Journal (March 30, p. 352).

belgium.—Cement of all kinds may now be exported without export licence requirement.

MEXICO.—Indigo, pitch, and vegetable wax may now be exported without payment of export duty.

SERB-CROAT-SLOVENE STATE.—As from March 3, the importation of a large number of articles is prohibited. The complete list which includes articles made of soap, stearine, paraffin, and the like, perfumed greases, pomades, and mineral oils, &c., was published in the Board of Trade Journal (March 30, p. 354).

SPAIN.—The Board of Trade Journal of March 30 contains (p. 356) a translation of a projected measure modifying the new Customs tariff.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

ALLKINS, W., The Rexall Pharmacy, Coulsdon, chemist, £35 11s. 5d. January 27.
 BELART (and wife), 179, Roundhay Road, Leeds, chemist, £10 4s. 2d. February 9.
 COOPER, W. Temple, 32, High Street, Wealdstone, chemist, £12 10s. 11d. February 3.
 COWLEY, William & Co., 5, Cathedral Yard, Manchester, chemical manufacturers, £12 17s. 9d., and £26 1s. 3d. February 8.
 EDWARDS, J. R. & Son, Castle House, Holyhead, chemists, £38 19s. 6d. February 6.
 LUREY, L., 202, North Street, Leeds, chemist, £16 16s. 11d. February 6.

Deed of Arrangement

SPARENborg, John Adolf, (trading as J. M. STEEL & CO.), 3, Thames House, Queen Street Place, E.C., and residing at Lady Margaret Cottage, Sunningdale, chemical merchant. Assignment upon trust, &c. (except goodwill, lease of premises, 3, Thames House, and benefit of a certain agreement, one cash creditor for £20,000, or thereabouts, agreeing to accept in satisfaction of his debt an allotment of shares in a private limited company, to be formed and named J. M. Steel & Co., Ltd., to which the excepted assets shall be transferred). Filed April 3. Trustee, A. N. D. Smith, Norfolk House, Laurence Pountney Hill, London. Secured creditors, £20,297; liabilities unsecured, £35,628; assets, less secured claims, £13,377.

Receivership

ENGLISH DRUG & CHEMICAL WORKS, LTD. J. H. Freeborough, of 25, Fig Tree Lane, Sheffield, ceased to act as receiver on March 21, 1922.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

BRITISH ELECTRON LTD., Manchester, metal refiners, &c.—Registered March 24, mortgage to bank; charged on land and works at Trafford Park, with power, machinery, &c. *Nil. December 14, 1921.
 GORDON (ALEXANDER) & SONS, LTD., Liverpool, tallow meltors, &c.—Registered March 21, £1,000 (not excluding) mortgage to bank; charged on land with stables, &c., at John Street, Birkenhead; also registered March 24, £2,500 debentures, to bank; general charge. *Nil. February 15, 1921.
 KEELINGS OXIDES (1921) LTD., Fenton.—Registered March 21, £10,000 (not excluding) charge, to bank; charged on land, works, &c., at Fenton.
 TRIPLEX SAFETY GLASS CO., LTD., London, W.C.—Registered March 15, £30,000 charge, to Cox & Co.; charged on Triple Safety Glass Works, Willesden.

Satisfaction

LAMBETH GLASS WORKS, LTD.—Satisfaction registered March 20, £5,000, registered August 24, 1920.

London Gazette

Company Winding Up

HUSBAND, A. J., LTD. A petition for winding up has been presented by the Rosin & Turpentine Import Co., Ltd., of 4, London Wall Buildings, London, E.C. 2, and is to be heard at the County Court, Scarsbrook Road, Croydon, Surrey, April 12, at 10.30 a.m.

Companies Winding Up Voluntarily

ALFRED BISHOP (SUBSIDIARIES) LTD. S. H. Bersey, 53, New Broad Street, London, E.C. 2, appointed liquidator.

COLOUR OXIDISING CO., LTD. A. C. Lucas, 60, Watling Street, London, E.C. 4, appointed liquidator.

DERBY FERTILISERS, LTD. O. Ling, 51, The Wardwick, Derby, appointed liquidator. Meeting of creditors at 51, Wardwick, Derby, on Wednesday, April 19, at 2.30 p.m. Particulars of claims, by May 15, to the liquidator.

ELSTREE CHEMICAL WORKS, LTD. O. A. Hibbert, 54, New Broad Street, E.C. 2, appointed liquidator. Meeting of creditors at Capel House, 54, New Broad Street, E.C. 2, Thursday, April 13, at 11 a.m. Proof of claims by May 8 to the liquidator.

Liquidators' Notice

WALKER DYEING CO., LTD. Meeting of creditors at the Chartered Accountants' Hall, 60, Spring Gardens, Manchester, Tuesday, April 11, at 3 p.m.

Bankruptcy Petition

LLOYD, L. (lately trading as The MIDLAND GLASS CO.), 22, Summer Row, Birmingham, dealer in photographic materials. A bankruptcy notice has been issued by Johnson & Sons Smelting Works, Ltd., of St. Paul's Works, Paul Street, Finsbury, smelters and metallurgists.

Notices of Intended Dividend

KEATS, Philip Phineas, 167, Mary Street, Balsall Heath, Birmingham chemist. Last day for receiving proofs, April 19. Trustee, J. D. Kerr, 5, Waterloo Street, Birmingham.

STEWART, Robert Dickie, 215, Archway Road, Highgate, London, paint manufacturer. Last day for receiving proofs, April 17. Trustee, E. H. Hawkins, 4, Charterhouse Square, E.C. 1.

Partnership Dissolved

TREHARNE, Frederick Gwilym and DUNCAN, James Hugh, analytical chemists, 125, Bute Street, Cardiff, under the style of TREHARNE & DUNCAN, by mutual consent as from February 28, 1922. Debts received and paid by J. H. Duncan, who will continue the business.

New Companies Registered

CAMBRIAN ELECTROLYTIC ZINC CO., LTD., 80, Bishops-gate, London. To acquire mines, oil or mining rights and metalliferous land; to adopt the electrolytic deposition of zinc process, &c. Nominal capital, £50,000 in 185,000 participating preference shares of 5s. each, and 75,000 ordinary shares of 1s. each.

GORDON HOLDSWORTH & CO., LTD. Manufacturers of chemicals and perfumes, collectors of perfume-producing vegetation, soap manufacturers, &c. Nominal capital, £3,500 in £1 shares (3,000 7 per cent. cumulative preference). A director: H. G. Holdsworth, 11, The Meade, Chorlton-cum-Hardy, Manchester.

FLEETWOOD CHEMICAL CO., LTD., 9, Prince Street, Deptford, London. Manufacturers of chemicals, colours, paints, oils, &c. Nominal capital, £2,000 in £1 shares.

HERCULIN GLUE AND COMPOUNDS, CO. (1922), LTD., Fulwood House, High Holborn, London. Objects indicated by title. Nominal capital, £100 in £1 shares.

HUGHMORE LTD. Inventors, manufacturers and exploiters of chemical and similar processes. Nominal capital, £2,000 in £1 shares (1,000 10 per cent. preference). A subscriber: T. Hughes, Shirley Park Hotel, Shirley, East Croydon, London.

JOWITT ENGINEERING CO., LTD. Manufacturers of gas producers and other machinery and plant. Nominal capital, £750 in 1s. shares. A director: J. E. Hackford, 37, Mecklenburgh Square, London.

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